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TWOPENCE

THE GREAT ADVENTURE

AN epoch of the first magnitude in the history of the world cannot be realised in all its manifold bearings, nor can its far-reaching effects be appreciated at their true value, by those who live through it. The true perspective only comes with the lapse of years. It would therefore be idle for us to attempt at this time to pass an uncompromising judgment on the rôle that aircraft have played in the war, or—and this may well prove the more important consideration for the years to come—of the influence of the war on the development of aircraft. At best we can only hazard a few timid guesses, point out certain tendencies that are already becoming dimly apparent, with here and there a solitary fact which emerges clear-cut from the welter and confusion.

One fact is immediately apparent. Alone among all the weapons used in modern warfare the aeroplane is not primarily destructive. It would tax the most fervid imagination to discover in what conceivable manner a Krupp siege gun or a Whitehead torpedo may eventually benefit the human race; from the standpoint of the science of economics all outlay upon weapons of destruction is pure waste, since it is non-productive. But with the aeroplane the case is different, since, as already stated, it is not save incidentally a weapon of destruction, but rather the reverse; besides which, warfare is only one of its functions. Now the war has given an enormous impetus to the science and art of aviation and to its industry, such as a decade of peaceful development could not have contrived. True, it came too early; it found us unprepared and our industry disorganised, or, more accurately, wholly lacking organisation; it found us with divers types of machines, many of them scarcely fledged, and with no clear ideas regarding our real needs. Central control there was none, and authoritative direction was dissipated. In these respects the war has caused a transformation, even though there is much room for improvement yet. The close of the year finds our industry and that in America flourishing apace, our output increased a hundredfold, while some semblance of order is being slowly, all too slowly, introduced in administration. In this latter respect one fact alone is perfectly clear: the severance between the two air services has become complete, and the last link that bound them precariously together—the Central Flying School—has snapped. However, it is too early as yet to estimate the full significance of this step, even if space did not forbid. Generally speaking, therefore, and much as we may deplore it from every other point of view, the war has exerted a

most beneficial influence on the industry of aviation and has caused it to reach a pitch of development from which it will never hereafter recede.

What of technical progress? Here we are on more uncertain ground which it were not prudent to explore too minutely. This much is certain: the machines which we possessed eighteen months ago and their immediate and logical descendants which are with us to-day have stood the test of war at least as well as those of any other nation and far better than most. For this eminently satisfactory fact, which is of bright augury for the future, we have to thank first and foremost the aeronautical branch of the National Physical Laboratory, whose labours have for the past four years been admirably carried out under the ægis of the Advisory Committee for Aeronautics. By the institution of this body Mr. Asquith wrought better than he knew, and if there still remains room for improvement in the manner of its direction—it is certainly open to criticism on the grounds of working too exclusively to comply with the behests of the Royal Aircraft Factory, of which at times it seems to be merely a subordinate and servile department, and too little for the benefit of the trade in general—at any rate the scientific results it has achieved are simply invaluable. Our one experiment in the endowment of science has at any rate borne copious fruit.

In the evolution of separate aeroplane types the issue is at present more obscure. Certain definite pre-war tendencies have become accentuated, and that is as far as one may safely venture. We have witnessed the development on a well-nigh incredible scale of three main types, not to mention many subsidiary ones. First, we have the two-seater scouting aeroplane, chiefly used for purposes of reconnaissance and "spotting." With the aid of photography these machines have even exceeded expectations; of their work in Flanders, in the Balkans, in Africa—of which I have been privileged to see certain results—it is impossible to speak too highly. Take the case of the Balkans, where for the moment French squadrons are chiefly in evidence. The country behind Salonika up to and beyond the Bulgarian and Serbian frontiers was hitherto to all intents and purposes uncharted. The only existing map, and a most unreliable one at that, apart from its large scale, which rendered it useless for staff purposes, was an Austrian production on a scale of 1 in 200,000, or over 1 inch to three miles, a most rudimentary effort altogether. But from the day of their arrival the French air service set to

work to map out the country chiefly by means of photography from aeroplanes, until to-day the survey is completed. Four years ago the Italians—using dirigibles and under far more favourable conditions—did exactly the same thing in Libya. Here, then, is a truly fresh development of aeronautical activity.

But two other clearly defined types of aeroplanes have emerged through the stress of hostilities: the machine built and designed exclusively for purposes of bombarding points of strategic importance—railway junctions, transport columns, stores, military factories, headquarters—behind the enemy's first lines (points which no gun is able to reach with certain effect), and the machine designed primarily to ward off hostile attack on the bombarding squadrons and to pursue enemy scouts. The former now generally mounts a light quick-firer, and its quota of machine-guns; carries a crew consisting of pilot, observers and gunners; the latter, probably a single-seater, is content to rely mainly on its speed, climbing powers and rapidity of manœuvre, and on a light machine-gun fired through the propeller. You have here the aerial counterpart of the battleship and the destroyer.

The French have shown themselves extraordinarily adept at this form of aerial warfare. Time after time they have launched attacks—sometimes in co-operation with British machines, as in the case of the raid on the forest of Houthulst and the cantonments concealed therein—on distant points in fleet formation, consisting of a squadron of relatively slow and cumbrous bombardment machines, protected by a swarm of nimble scouts, on places far within the enemy's borders; and as a rule these massed attacks have met with but little opposition and suffered but slight damage from any anti-aircraft fire. The truth is that aerial attacks of this nature, starting as they do from one or more bases far behind the lines and consequently concealed from the enemy's observation, directed as they may be against any one of several points hundreds of miles apart, are extremely difficult to counter effectively, while to prevent them absolutely is a matter of sheer impossibility. Folks at home would do well to bear this fact in mind when the periodical outcry against Zeppelin raids breaks forth anew; for a Zeppelin presents the additional difficulty from the defender's point of view of navigating in the dark while its radius of action is far more extensive than that of the aeroplane as we know it to-day.

As I have often pointed out, there are two means of defence against Zeppelins. The first is the anti-aircraft gun—enormously improved, be it added, in vertical range and accuracy of fire since the beginning of the war—which is a poor and uncertain weapon at best—and the second is the traditional British method of defence, which consists in offence, for the Zeppelin is more especially vulnerable, not in the air, but in its lair, and, as repeatedly stated before, there is scarcely a German airship base designed for depredations on England and on the North Sea which is, or soon will be, out of range of our long-distance aeroplanes.

Which brings me to another point. Of all the combatants at the outbreak of hostilities the Germans alone possessed an effective aerial weapon of offence in their Zeppelins; their time of superiority in this respect is

fast fading away, and the wonder is that the Huns hitherto have not made better use of their opportunities in this respect than the little they have actually done, for the damage they have wrought is, from a military point of view, totally insignificant. What means we are adopting in conjunction with our Allies to prepare for long-distance raids over German territory I am not at liberty to specify; suffice it to say that they will make their presence felt in due time.

On the other hand, I may be permitted to point to the evolution, long foreseen, but not realised until after the outbreak of the war, of the high-powered aeroplane capable of great endurance and a prolonged stay up aloft. Both the French and the Germans have produced twin-engined machines of great power, speed and climbing capacity, provided with fairly powerful armament and a crew of several hands. Owing to their ability to fly at low speeds by throttling down their engines and thus to economise fuel, their radius of action is already far in excess of anything known before the war, and it is not too much to say—though I would certainly have emphatically denied the possibility twelve months ago—that to-day a machine can be built capable, with luck, of crossing the Atlantic. The importance of this development—which, as Benjamin Franklin remarked of the balloon, is as yet an infant, but will grow—from a commercial standpoint in the time of peace which will come one day is incalculable. Already in America regular passenger services by aeroplane have been instituted and successfully run in various places—not occasional “joyrides”, mind, when the weather served, but *bonâ fide* and regular services between two points distant several scores of miles—and this coming spring a regular mail service is to be inaugurated between St. Louis and a neighbouring town where no direct railway communication at present exists. These are matters already well within the bounds of possibility.

Meanwhile four points of detail stand out as still being in urgent need of improvement. First, a drift-indicator which, in conjunction with a reliable and efficient compass, will render flying by night and through fog or cloud really practicable, while it is essential in long oversea journeys, where no landmarks are available to steer by. Secondly, an effective sighting device for purposes of bomb-dropping—of which ilk many have been evolved, but on the whole with far from satisfactory results. Synonymous with this is an instrument accurately indicating the ground-speed as against the ordinary air-speed-indicator, which is practically useless in this connection, though something in the pendulum line is now being produced which bids fair to yield promising results. Inventors please note. Thirdly, a better and more efficient means of communication between pilot and observer—such as the Thermophone—is more than desirable. And fourthly comes the silencing of the engine. Small points, these, you may object, as compared to the vast issues that confront us. Small they may be as component parts of the entire scheme of things, but not without their importance. For instance, an accurate sighting-device would transform the aeroplane, from a contrivance scattering bombs or darts somewhat aimlessly in the fond hope that one missile out of a score may reach its target, into the most deadly long-range weapon of diabolical precision that the world has yet seen.

J. H. L.

"PRESS DAY." A DRAMA IN ONE ACT

By RODERICK RANDOM

[This account of the solemn and momentous weekly procedure of preparing AERONAUTICS for press is not so much a caricature as a gross and offensive libel. Needless to say, neither the editor, the manager, nor any other member of the staff, not even the liftman, is prepared to acknowledge this wholly frivolous and fictitious description as resembling in the remotest degree the true and earnest facts of the case.—ED.]

Time: Late

Scene: Inner and Outer Offices of AERONAUTICS

Characters (more or less) performed by

THE CHIEF, HAROLD NORTIK,

and

ALL STAR COMPANY

Curtain rises on THE CHIEF, seated in Inner Office, his head supported by his left hand, and his right hand controlled by a fountain pen. At another table sits LADY SUPERINTENDENT correcting proofs.

CHIEF (*soliloquising*): Thank goodness I'm on the last slip. Not bad, I think. (Reads aloud to LADY SUPERINTENDENT) "But this tendency to tamper with pre-existent formulæ, although winked at now and again by the authorities, is in itself a movement towards the supererogatory attempt to pile Pelion on Ossa"—or is it the other way? but I can leave that to the printer—"on Ossa, and forms only a part of that centrifugal motion which, on all the lesser attributes of sidereal attraction, may well bring about—*de te fabula*—some element of that uncertainty to which——"

(Exit LADY SUPERINTENDENT)

(*sol.*) I never had overmuch faith in the feminist movement. The higher education is wasted on some of these ladies. She has charm, yes, but the truth is not in her. She might understand me if she made a close study of Robert Browning. As Tree once remarked, we men of genius flourish best on praise, praise, praise. I'll have in our manager. (*Calls autocratically*) Nortik! Come here! I want you.

NORTIK (*staccato*): Can't come! Busy!

(Exit CHIEF. There follows an unseemly scuffle in outer office.)

(Enter NORTIK in the powerful arms of his Chief, who pins him down in the visitor's chair.)

NORTIK: Look here. This is beyond a joke. Seventy-five pages of ads. this week, and I haven't decided what to hold over. And I say—let me tell you that was a clean collar this morning; and how can I go to the printers if I'm untidy? (On CHIEF relaxing his grip, NORTIK forces false shirt front under waistcoat on the entrance of

LADY TYPIST.

She is dark-eyed, dignified and Orientally beautiful. She enters to the rhythm of "Sound the loud timbrel o'er Egypt's dark sea.")

CHIEF (*rather breathlessly*): Ha, lovely Miriam, what wouldst thou?

(NORTIK coughs)

LADY TYPIST: A chauffeur has called for his fare and also for the half-crown which he says he lent you last night.

CHIEF: Tell him that the fate of the British Empire and, therefore, of the whole world, depends upon my editorial article being written without further delay

or other ghastly malfeasance. O stenographic goddess, tell him that and bid him go hence.

NORTIK (*sharply to L.T.*): Pay him out of the petty cash! We don't want any gory scenes in this office.

(Exit L.T. NORTIK rises, but his coat tails are promptly seized by THE CHIEF.)

CHIEF: No, you don't, Nortik. It's my turn to take an observation of the prevailing atmospheric conditions of Fleet Street. (Places deerstalker hat on his own majestic dome of thought.) When the Lady Superintendent returns, tell her to 'phone up the printer that I shall be there in forty-three-and-a-half seconds.

NORTIK: And do you think I am going to hang around here to stave off printers' boys every five minutes, and we've had fourteen applications for Christmas boxes already?

CHIEF: Do not attempt to be eloquent. Leave that to me.

(Enter SHABBY OLD GENTLEMAN)

NORTIK (*testily*): It's after six, sir, and the business department of this paper is closed. It's simply too sickening. You're the fourteenth cadger we've had up here to-day. Benevolence is a fine thing, but when it comes to being humbugged about day and night——

OLD GENTLEMAN (*interrupting*): Sir, I am sorry to have disturbed you. I had called to ask you if you could sell me all the bound volumes down to date, take my subscription for the next year, and allow me to book a double-page advertisement for one of my friends for the next fifty-two weeks. No, don't apologise. I shall go to the rival paper to-morrow, and, in the meantime, I should advise you to lock your door against any other importunates like myself. I wish you good-night! (Slams door)

(NORTIK faints. After vain attempts to resuscitate him, THE CHIEF calls for THE LIFTMAN. Enter LIFTMAN—a short, powerful fellow.)

LIFTMAN: There an't no fevers as we can burn, but I thinks that my pipe under 'is nose'll bring 'im rahnd. (It does, whereupon THE CHIEF and THE LIFTMAN face one another and try the preliminary steps of a *pas de deux*. THE LIFTMAN then refreshes himself from a side pocket, and his attitude changes abruptly.)

LIFTMAN: 'Aven't you gentlemen got any 'omes? D'ye think I want to 'ang' rahnd 'ere the 'ole bloomin' night? Nice name to 'ave—Nortik! (To CHIEF)—And I b'leeve you're a German spy——

CHIEF: You say that again. (LIFTMAN does, whereat CHIEF joins issue and a battle royal is fought out on the landing. Usual result, as in all decent fiction—science tells. Cambridge scores over Camberwell. At the moment of triumph LADY SUPERINTENDENT and LADY TYPIST appear on stairs from floor above and, whilst their hands are raised either in horror or blessing, NORTICK is heard singing—

We're in an awful mess,
But if it doesn't rain
They all can go to—press,
And I shall catch my train!

(Ribald laughter from CHIEF and LIFTMAN)

Pas de Quatre

and

CURTAIN

THE STRAFER—IV.

END OF THE FIRST STAGE

AND now there appeared upon the scene the first-born of his purely commercial ventures, for the old Count, for all his early losses and professed disinterestedness, had a shrewd eye to business. Remember, at this very period of his career he had been enthroned—and that for no apparent reason, since the whole of his aeronautical career hitherto had consisted merely of a succession of failures—as the idol of the German people before whom the serried ranks of worshippers bowed down at the imperial behest. Honours galore had been showered upon his whitening head. And this is the moment chosen by the astute old Count to launch himself into a purely commercial venture.

By some means there was created the so-called "Delag," a private company constituted with the avowed object of running passenger airship services for commercial profit. Who was the moving spirit of this unfortunate concern is not really known, and, having regard to the machinations and ramifications of German finance in recent years, the truth is not likely to be revealed from an authoritative source for some time to come; but I may hazard a shrewd guess that the octopus which has gradually extended its tentacles to the greater portion of the modern German industry, under the leadership of Herr Rathenau—the A.E.G. or General Electrical Co.—had its finger in this particular pie also. No doubt the company was formed with some ulterior motive, probably not unconnected with Germany's elaborate and old-standing preparations for war, for the company's airships and sheds were certainly from the inception of the concern in receipt of a heavy Government subsidy, while they also served as training vessels for the formation of military and naval crews.

Here, then, we enter upon the final period of Zeppelin's first stage as the Strafer, with the appearance upon the scene of L Z 7, styled the "Deutschland," and built for the "Delag." This company was only enabled to continue in existence by the grant of a heavy Government subsidy, for from the very beginning its commercial operations were far from satisfactory and its career far from fortunate. Thus, on June 28, 1910, the "Deutschland" was completely wrecked by a strong wind supervening upon engine trouble, being blown down into the Teutoburg Forest during the course of a passenger trip. Its successor, L Z 8, also known as the "Deutschland," was totally wrecked at Düsseldorf on May 16, 1911.

Zeppelin's Arctic Expedition

Before closing this brief sketch of Zeppelin's career some reference should be made to the Arctic Exploration Expedition, of which he was the nominal leader, undertaken by him (needless to say, under the same august patronage as before) during the years 1910-1911. I say, advisedly, the nominal leader, for the moving spirit of this venture—as, indeed, he was of all Count Zeppelin's activities of later years—was Professor Hergesell, a meteorologist of eminent achievements and a typical close-cropped German of mature years. This much-belauded expedition, as most of those wherewith Zeppelin has been associated, proved a failure. True, it succeeded in establishing on the island of Spitzbergen a meteorological station destined to make observations for a future nebulous attempt to reach the North Pole by means of a Zeppelin airship—the venture was launched before the days of Peary and Dr. Cook—but this was the sum-total of its achievements. It is worthy of note in this connection that this station remained in permanent activity until a couple of months ago, when, as reported from a foreign source, it was destroyed by a British landing-party, together with its powerful wireless installation.

Here we may fittingly close this brief review of Zeppelin's early aerial career, since it may be said to mark the end of his purely experimental efforts. From this time forward

fortune began to smile upon him. As already stated, the history of these early craft is often obscure and difficult to trace, which is no doubt the chief reason why it has never hitherto been attempted. But even within the limits of this short survey the costly nature of Zeppelin's experiments must be apparent. With a single exception, every one of his first eight airships, from the end of 1900 to the summer of 1911, was destroyed. Even calculating the cost of these craft at £30,000 apiece—and in view of the experimental nature of the work, this estimate is certain to be well below the mark—something like £210,000 must have vanished into thin air by these means. One may well wonder whether the killing of a few English and Polish civilians, the wrecking of an East Anglian cottage or two, and the wounding of an odd barnyard fowl represent to the Strafer adequate recompense for this vast expenditure of time and money.

The Reckoning

What in the way of damage upon English homestead and innocent English life the Strafer has hitherto achieved may not be stated; the fiat of authority has gone forth, and we must perforce remain silent. How ludicrously inadequate was the result as compared with the Germans' fondest expectations most Englishmen know. It has remained for a Frenchman to put this knowledge into concrete form. I hasten to add that I pretend to no information regarding the accuracy of his facts, but, as a typical and generally correct example of the foiling of the Strafer, his calculations may serve. Certainly, neither is the picture too highly coloured, nor the balance-sheet faked.

M. François Laur, a French Deputy, recently made some curious calculations which would appear to prove that the German reputation for practical economy in regard to the effort expended and the object attained is scarcely borne out by actual results. As an example this writer takes the following typical raid:—

Three Zeppelins depart from Cuxhaven, a distance of 360 miles, and raid Waldon, Lowestoft, Southwold, Harwich, Felixstowe, and Gorleston, covering 420 miles during the period of the raid over England, and fly back 360 miles to Cuxhaven. Total distance covered, say, 1,100 miles, including detours.

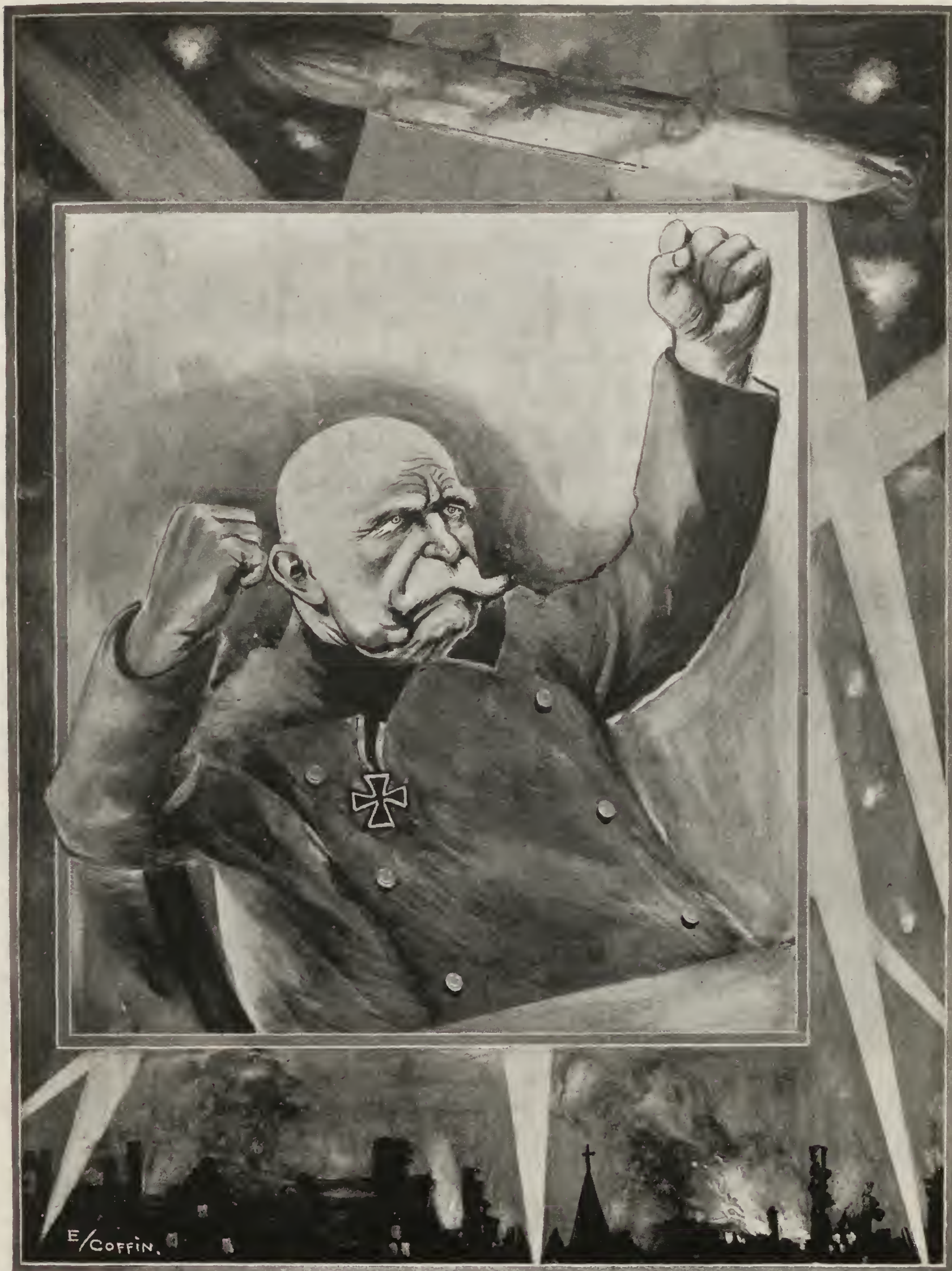
Results of the raid: A vehicle struck at Waldon, two horses killed at Lowestoft, a hospital inmate wounded at Southwold, and ten chickens put to death at Harwich, Felixstowe, and Gorleston—total: two persons wounded, two horses killed, and a few chickens slaughtered.

Now for the other side of the balance-sheet. A Zeppelin on an average has a crew of thirty, comprising four officers, eight mechanics, four observers and navigators, besides gunners, bombers, and other personnel. This crew represents a daily expense of some £40. Besides this, a Zeppelin, with its motors, provision of petrol, spare parts, ammunition, and machine guns, is worth something like £140,000 as it leaves its hangar. On the basis of three years' purchase, plus interest, this represents a daily cost of somewhere about £140. Running expenses on a war footing amount to another £40 a day.

Total expenses:—

Pay of crew	£40
Interest and sinking fund	140
Upkeep	40
Miscellaneous	20
	<hr/>
	£240

Here, then, we have a craft costing £240 a day and representing a capital of £140,000. In a recent raid on England, occupying about three days (including preparation and



THE STRAFER
By ERNEST COFFIN

going and coming), the expenses of the three airships which participated therefore amounted to a total of £2,160, and this, mark you, with the result of wounding two persons and killing two horses and ten chickens.

On this basis M. Laur computes that since the beginning of the war the Germans have thrown to the winds (the simile is an apt one) some £800,000 in out-of-pocket expenses, while tying up a capital sum of about £6,000,000 spent in construction, not to mention upkeep *in the hangar*, which amounts to about £15,200 per Zeppelin per annum, with the results that we have seen.

German organisation may be a mighty wonderful thing, but from a severely practical point of view it may well be doubted whether the Kaiser and old Zeppelin have been getting good value for their money by investing six millions

in order to hit a couple of Englishmen, two English horses, and ten British chickens.

Responsibility for the calculation of expenditure, for the initial cost of the Zeppelin fleet, and for the results of the raid in question rests entirely in M. Laur; its accuracy I am not prepared to guarantee; but it may well serve as a striking example of the grotesque disproportion between the effort expended by the Germans in this particular field of action and the results obtained. Certain it is that, if even we allow for newspaper exaggeration, the Germans have inflicted upon themselves, or have had inflicted upon them, far more serious loss of life (in the destruction of trained crews), not to mention material, than they have exacted through the medium of their Zeppelins.

J. H. L.

PROGRESS OF AMERICAN AVIATION

THE MODEL "C" TWIN MOTORED BENOIST CRUISER

THE new Model "C" Benoist airboat differs radically in some ways from preceding models in the power and power plant placement, but not to any great extent in other details.

No. 101, the subject of this article, is equipped with two 100 h.p. Roberts motors set up in the planes and driving individual propellers.

Besides the differences noted above between this boat and many others, this boat is now being built without any step; although the illustrations are from photos taken of this boat when it had a step. It has been found that with the bottom construction used by the Benoist a step is not needed, as the boat can easily get out of the water with the load possible to carry in the air, and, of course, can be constructed stronger without the step, which eliminates other difficulties, especially that of "looping" when about ready to take to the air. However, when the step is used on this hull it is placed much farther back than in some boats, whose



THE BENOIST FLYING BOAT

The boat in design and construction follows the latest models developed by this company the last season. The boat is of the short hull variety, differing radically in this respect from many airboats built at the present time. "Tom" Benoist, the designer of this new machine, has always been a believer in the superior efficiency of the short-hull design over that of the long hull with its decreasing cross-section of stern. In other words, the boat hull has the same width from one end to the other. This short hull has been used in the Benoists, more or less, ever since they developed the Benoist Tractor Hydro-aeroplane in the autumn of 1911. However, all kinds of designs and constructions have been used and experimented with, only to come back each time to the short hull.

manufacturers claim that the step is approximately at the centre of gravity of the machine, and air pipes conduct air under pressure to the step.

The general specifications are as follows: Span, 65 ft.; chord, $5\frac{1}{2}$ ft.; gap, 6 to 5 ft.; aspect ratio, 11. The machine loaded light, that is, ready to fill up and fly, weighs 2,450 lb. Loaded heavy, 3,700 lb., making a useful load of 1,350 lb. = 18.5 lb. per h.p.

The wings are developed from those used so successfully in preceding models of Benoist planes, but improved in construction and changed in camber to suit the special conditions required in a machine of this kind. The main wing spars are of spruce, with a cross-section of 2 by $2\frac{1}{2}$ in. at the inner ends to 2 by $1\frac{1}{2}$ in. at the outer ends. All spars

and struts have been carefully tested for their crushing strength at the laboratory of the Armour Technical Institute, and must show a factor of safety of from eight to ten or the dimensions of the piece are increased regardless of weight until it does show this factor.

The guy wires are Roebling 19-strand aviator cable, and also must show a factor of more than eight, as must the turnbuckles and bolts and steel fittings. The inner box sections in the positive or carrying wires are $\frac{3}{16}$ doubled; while the outer boxes are guyed with $\frac{3}{16}$ single wires. The wings are covered with a strong unbleached Irish linen, processed with five coats of special Benoist dope and finished with two coats of Valspar.

All wing fittings are made of sheet steel stampings, spot-welded when necessary.

The guy wires, instead of the usual loops wrapped with fine wire and soldered for taking turnbuckles and anchors, are produced in a neater and more workmanlike way by slipping small brass ferrules over the wires when turned back to make the loop and then soldered in place. The opposite end of the guy wire from the turnbuckle is provided with a loop, but not soldered or fastened in the eyelet of the fitting permanently, as is the case with most wires. The fitting is provided with a small bolt, which can



THE BENOIST 6-SEATER BOAT IN FLIGHT

be taken out by removing a cotter pin, and in this way all wires can be made up entirely on the bench and attached in an instant. This makes it possible to carry a few wires already made up, and in the event of breaking a wire another can be slipped in in a moment's time without resorting to soldering, which is often a difficult operation if it is necessary to do this work away from the shop.

The centre section of the wings follow the same designs worked out by Tom Benoist and used for the last two or three years. It will be noticed that a system of half-diamond struts is used for carrying the boat section instead of the usual rectangular box truss. One of the reasons for using this construction is the great strength and rigidity of this style of building, and another important reason is the fact that the space between the centre two struts does not require the use of guy wires. By eliminating these it is much easier to get around the engine section, as one can walk from the cockpit of the boat clear back to the stern without having to crawl through the wiring, making it much less difficult to get at the motors or any of the mechanical parts that may need adjustment.

It will be noticed that the lower plane is set at a slight

dihedral. This lower plane has a rise of 1 ft. in 32, and while it serves to make the machine more stable, the biggest advantage sought was in getting the outer ends of the planes a greater distance from the water—as on a wide plane there would, of course, be a greater tendency for the end floats to dig in the water with the same height of boat free board than with a narrow plane.

The boat is made of first-grade clear mahogany. The sides are $\frac{3}{8}$ thick, while the bottom uses a double layer of $\frac{3}{8}$ mahogany from the rear struts forward, and a single layer back of the rear struts.

A standard Dep control is now used, but the machine can be equipped with any control wanted. The illustration shows the Benoist control.

The cockpit is rectangular with a lateral dimension of $5\frac{1}{2}$ ft. and a fore and aft dimension of 5 ft. This allows of two long roomy seats extending clear across the cockpit and will accommodate six people comfortably, and also leave plenty of room for the operator.

The machine is equipped with two 100 h.p. 1916 Roberts six-cylinder motors, direct connected to 9 ft. diameter by 6 ft. pitch propellers driven at 1,100 revolutions.

The photographs show the machine in action during some recent tests made over the Mississippi at Chain-of-Rocks, just north of St. Louis. In these tests it was found that she would get off the water and fly easily with seven passengers on board and 30 gals. of petrol. One of the photos shows the seating arrangement of the cockpit and also the motor placement.

After these tests the machine was brought back to the shops, and a system of self-starters for the motors is being installed. Then the machine will probably be sent to Florida to work through the passenger-carrying season, and is offered as another standard model by the Benoist Company for the coming season.

A larger boat, to have two 325 h.p. Roberts 2-cycle motors, is now under construction.

BRITISH ARMY STUDENTS TO LEAVE TORONTO

THE Curtiss flying school at Toronto will remove shortly, under present plans, to Vancouver, on the Pacific coast, where more mellow weather may be found. This cancels the previous expectations of spending the winter in Bermuda.

ATLANTIC AERONAUTICAL STATION

THE Atlantic Aeronautical Station is being located at Norfolk, Va., with which are allied Curtiss interests and Captain Thomas B. Baldwin. This is to be more or less an experimental station, and may last through winter and summer seasons. Captain Baldwin has been connected with the Connecticut Aircraft Co., which obtained the Navy contract for a dirigible.

EARL OVINGTON MAY AGAIN ENTER FLYING

EARL L. Ovington may be active again in aeronautical circles. He has made several trips South to look over locations, and is considering the construction of monster aeroplanes which will carry engines of 500 or more horsepower. Mr. Ovington was one of America's pioneer flyers, learning at the Blériot school at Pau. He made numerous flights in America upon his return, and after a short connection with the Queen Aeroplane Co. left aviation, and is now conducting a successful laboratory for the cultivation of bacilli.

NEW ALTITUDE RECORD FOR HYDROPLANES

On November 29th, at Pensacola, Florida, Lieut. R. C. Saufley, U.S.N., broke the world's altitude record for hydro-aeroplanes by climbing 11,616 ft. in one hour. Lieut. Saufley flew a Curtiss Model "E" hydro driven by a Model "OX" 90 h.p. Curtiss motor.

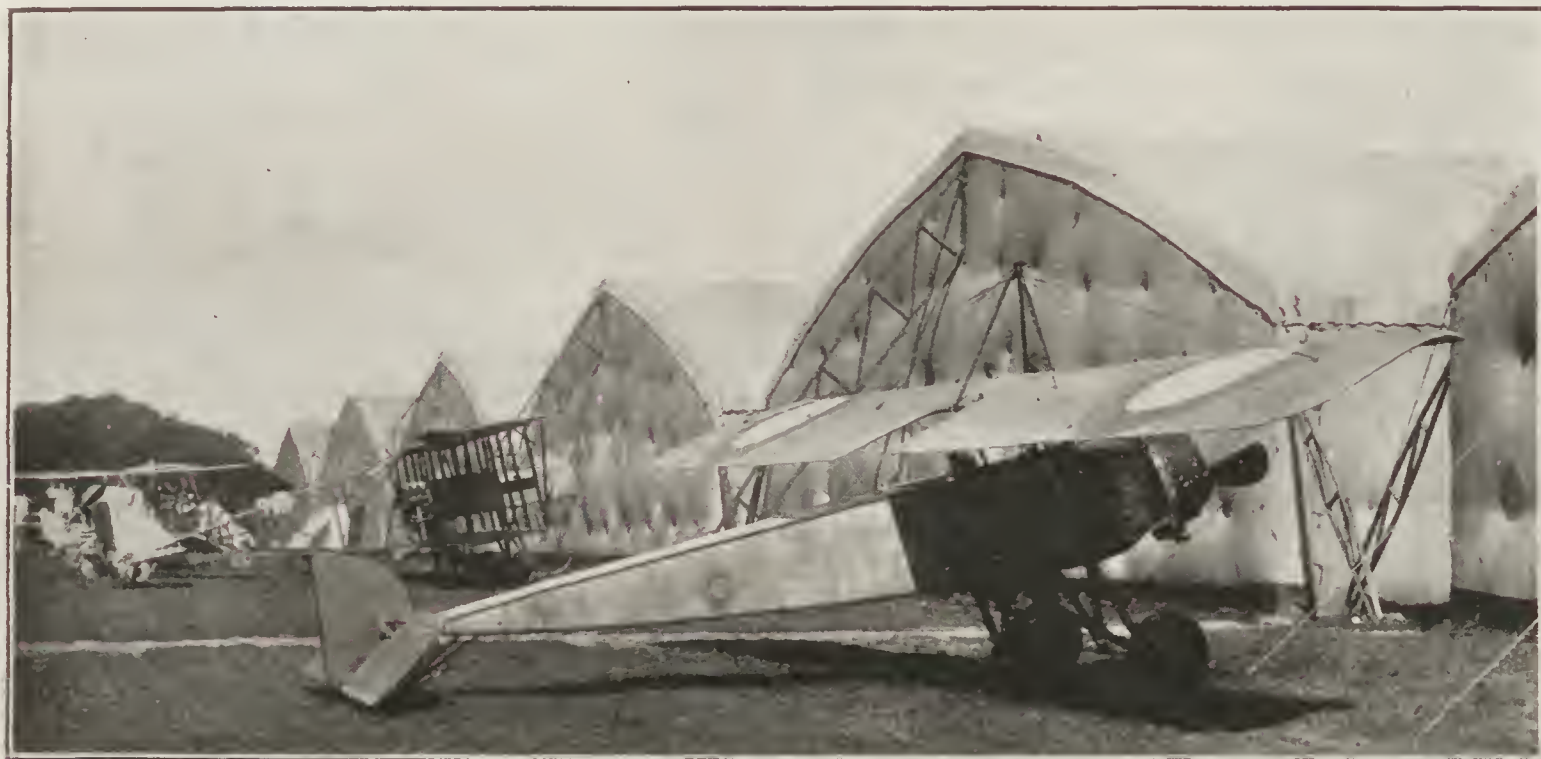
The previous altitude record for hydro-aeroplanes was held by Lieut. Bellinger, who recently ascended to a height of 10,500 ft.

THE MORANE MONOPLANE IN WAR

WHERE such splendid work has been done by all concerned, almost without exception, it may at first sight appear invidious to single out any particular type of machine for special reference, but rather to apply to their doings the same salutary custom which prevails among us and our allies in regard to the exploits of individual members of the air services which remain discreetly veiled in anonymity until the belated publication of the Honours list. Alone among the combatants the Germans have throughout failed to comply with this tacit rule of aerial etiquette, so that from time to time we find main headquarters pompously announcing that Lieutenant So-and-so on the previous day shot down his seventh aeroplane. But if it may be desirable, in fact more decent, for individuals to sacrifice for the time being their identity and to merge it in the common effort, surely the same consideration cannot be made to apply to the instruments which have enabled them to carry

finest and most finished of all Blériot's pilots, as his performances at the Bournemouth meeting showed—and the latter as designer. Saulnier subsequently joined the Borel firm for a while, and finally linked up with Morane when the latter, after a serious accident, gave up piloting and started out as constructor on a large scale. To Saulnier, one of the exiguous band of aeroplane designers of the very first class, the design and success of the Morane monoplane is chiefly due.

The standard Morane monoplane stands in need of no detailed description; its features and its record are sufficiently well known. During the war it has rendered sterling services and has provided a mount for most of the French crack pilots, such as Garros, Brindejone, Pégoud, Gilbert and Védrières. Latterly the addition of a bullet-deflector to the propeller has enabled it to be fitted with a light machine-gun fired through the revolving propeller,



ONE OF THE FAMOUS MORANE PARASOLS AT A TEMPORARY BASE IN FRANCE

out their exploits. Much must for the time being naturally remain unsaid in this respect; yet it were well even at this juncture, without disclosing material facts, to refer briefly to some of the machines which have rendered such splendid services from the very outbreak of hostilities. Some, it is true, have failed to stand the harsh test of war, and among them not the least famous brands in time of peace; but others have emerged triumphant from the ordeal.

In this respect a proud place is occupied by the Morane, whose designers and manufacturers have every reason to be satisfied with their efforts; for be it noted that, although the Morane forms a large part of the equipment of the French and British (and presumably the Russian) air services, the machine remains substantially the same in design and construction as the pre-war types. More, the Germans have paid it the compliment of imitating it to the best of their ability; for the Fokker monoplanes, which for long proved our most persistent adversaries along certain portions of the front—and one of which was recently exhibited at the Horse Guards—were simply Moranes decked out in the most flimsy of disguises.

Both Léon Morane and Robert Saulnier, who constitute the moving spirits of the Morane-Saulnier combination, may be said to have graduated with Louis Blériot, the former as pilot—in the early days he was undoubtedly the

thus retaining all the advantages in speed and climb possessed by a single-seater. With its companion, the Morane "parasol," it has become one of the established types of what the French term the "avion de chasse," which may be translated on the maritime analogy as "destroyer."

The Morane "parasol" has also acquitted itself magnificently. This type, the precursor of all parasols, has the wings raised slightly above the fuselage, so that the pilot has a clear view in every direction and, quite as important, can drop bombs without being compelled to bank vertically, as in the case of the ordinary Morane monoplane. The parasol made its first appearance in the capable hands of Garros at the last Reims meeting in 1913.

The Morane owes much of its success to the excellence and strength of its construction, which enables it to withstand very effectively the strains, rough handling and weathering incidental to active service. Its capacity for rapid manœuvring is notorious and—an interesting little technical point this—it is the only machine in existence possessing a "floating" as opposed to a fixed tail. In conclusion it may be recalled that it was while flying a Morane parasol that the late Sub-Lieutenant Warneford annihilated a Zeppelin last June and that Garros and Védrières won their glory. Honour where honour is due.



Copyright Photo]

ROLAND GARROS IN HIS MORANE MONOPLANE

[F. N. Birkett



JULES VÉDRINES ON BOARD A MORANE-SAULNIER EQUIPPED WITH A LIGHT MACHINE GUN
(Note the bullet-deflector on the propeller)

RANDOM REMARKS

XXXI.—THE RETURN OF THE HARPIST By ARTHUR LAWRENCE

Illustrated by DUDLEY HARDY, R.I.

IT is for others to review the past year, or become one of the prophets. It is for me to seize on the salient. It is for me, as for none other, to select the essential change which is taking place, to make my point and drive it home with all the patriotism of an



old German frau giving the graven image of Hindenburg a kidney punch with a silver nail and a mallet. Smile upon me, and I am with you, my lads, in all the hopes of 1916 and the triumph of AERONAUTICS and its very own special number. So there, now! Cheer up, and treat the pessimist as the pseudo-working man treats his wife. So much for my greeting; and now to the subject. The tentacles of the Censor have spread farther than some may imagine. This is a good sentence, so let us proceed. In detail he is a rather poor thing, and I really know something about it. He is very largely a shop-soiled piece of goods, a fellow of some education, but who has not before had any specific demand for his services. If every sort of influence fails, he is to be seen in some other part of the world as a remittance man. If his end is announced, his parents do not perish from inconsolable grief. Not exactly. They shake hands together under the cover of Fate, or Destiny, or It Seemed as If It Had to Be. He has been merely the detail, the inefficient, or, if you like, over-effective instrument of a thoroughly undesirable secrecy. He gets a few hundreds a year (for the first time in his life), and the lads who are writing home get the knock.

I have no wish to dwell on the painful side of the business. Every cloud has a silver lining if you use

the searchlights in the right way. The work of the Censor has gone beyond his direct efforts. Indirectly, I attribute to him an increased iciness of communication. No one writes letters now. They do no more than send one a hasty and pusillanimous scrawl. Mostly, they do not do even that. They omit to write altogether, and content themselves with oral apology if and when you should run across them. Our newspapers are little more than blank sheets. In fact, they have started cursing one another, which is far worse. Can there be no revival of the epistolary efforts of old? I fear not. Indeed, the other day, whilst waiting to see a man, I picked up the first book that came handy. It was entitled "The Complete Letter Writer," and fell open, of its own accord, at the heading, "Borrowing Money from a Friend." My affairs were such that I stood in no danger. Of the letters I used to receive I can only find one. I am destructive of correspondence. It does not do to have letters lying about after one's decease. One never knows, does one? At least, not really.

My friend had just "come into" a bit of money and a place in Scotland. He wrote: "May your affairs flourish. I had a filthy journey—snow all the way and a carriage full. Two days' snow in Edinburgh; but from the hotel one looks out with different feelings, and one can amuse oneself going about ringing bells and dragging strange servants to the light of day.



Edinburgh gave me the impression of being in the course of erection. It lies about in a very disorderly manner. The station is largely responsible for this. The legal luminary who is meditating whether he

shall do my business or let it do itself is one of the objects of interest in the town. A genuine old and crusted relic of remotest antiquity! He has a coat-of-arms and a hat which date from Robert the Bruce, low "Blucher" shoes, and three visible inches of white stocking. His trousers cling to his leg in an anxious manner, and his front view is largely composed of upper lip. His conversation is very worm-eaten, consisting largely of Scriptural distortions and of the broadest Scots." So much for a little pen picture which I was permitted to verify.

There are other ways of making one's communications not too official. One of my friends, an officer not long back from our affair at Loos, has adopted rhyming slang. I will give a few lines from his last letter, without offering a prize for a translation. It gets a bit beyond me at times, but it amuses me to puzzle it out. I had asked him to call at a certain place for a book, and in regard to that word it will be seen that he does not confine himself to rhyming slang, for he reduces the reference to the word "horn" for horn-book. "Your epistle quite safely to German. I will to the Almond on Monday and personally see to the removal of the Horn. I forgot it yesterday. Maybe I shall catch a glimpz of your nobile and refined Jim Mace on Monday. I saw the Honourable and Reverend X yesternight. I rather fancy that, given the success of a certain financial proposition, he was off in the Sewer to X. I frequented the Pit in company with one X.X., who there set up his gob for the space of a castle and tower or so. I may remark *en passant* that I was not elephants in any way, as I was on my way to Charley Skinner with a relative. P.S.—I am remaining quiet to-day at home or, as our versatile friend would put it, Pope of Rome, and taking a glass of in and out, as it is the hour of high twelve." Such a note as this, if it had come to me from abroad, might have aroused the worst suspicions in the mind of some censor unaccustomed to move in the best circles.

No, I am afraid even the most modest attempts at the epistolary art, that casual and personal form of literature which you can hug to yourself in egotistic enjoyment, will never return. Moreover, you now have to pay twopence if you are over the ounce, which presses most on the already almost bankrupted author. In fact the manager of this paper recently mulcted me of—but I refrain. In the spirit of the New Year I will try to forgive—and forget him. Consequently we come to the text of my argument. With blank newspapers and the censor and increased postal rates we must hail the return of the harpist. He shall sing us the deeds of the present. He shall sing of the future, of almost anything, as long as he smiles, the old villain. I have cast myself for the part. My fingers are still long and clutching, quite excessively so. I was once head chorister of a cathedral. I will make the welkin ring. Scott describes me precisely. "The minstrel was infirm and old, His withered cheek and tresses grey, Seemed to have known a better day. His harp, his sole remaining joy, Was carried by an orphan boy." I shall be prepared to take on an orphan boy without any references, as I shall prefer to handle the

money myself. At first I may confine myself to parodies of lays and ballads so as to feel my way.

You know the old ballad:

"There was a youth, and well beloved youth,
And he was a squire's son,
And he loved the Bailiff's daughter dear,
Who dwelt at Islington."

In the "Collections and Recollections" of G. W. E. Russell I have come across a parody which was written by the then Clerk of Parliaments. Every verse of it is bon ton to those familiar with the old song:

"Il y avait un garçon,
Fort aimable et fort bon,
Qui était le fils du Lord Mayor;
Et il aimait la fille
D'un sergent de ville
Qui demeurait à Leycesster Square.

"Mais elle était un peu prude,
Et n'avait pas l'habitude
De coqueter, comme les autres demoiselles;
Jusqu'à ce que le Lord Mayor
(Homme brutal, comme tous les pères),
L'éloigna de sa tourterelle."



After several years' absence, and after she had arrayed herself in "une toilette de très bon goût":

"Mais bientôt elle s'assit
Dans la rue Piccadilli,
Car il faisait extrêmement chaud;
Et là elle vit s'avancer
L'unique objet de ses pensées,
Sur le plus magnifique de chevaux!

“ ‘ Je suis pauvre et sans ressource !
 Prête, prête-moi ta bourse,
 Ou ta montre, pour me montrer confiance.’
 ‘ Jeune femme, je ne vous connais,
 Ainsi il faut me donner
 Une adresse et quelques références.’

“ ‘ Mon adresse—c’est Leycesster Square,
 Et pour référence j’espère
 Que la statue de Shakespeare vous suffira.’
 ‘ Ah ! connais-tu ma mie,
 La fille du sergent ? ’ ‘ Si ;
 Mais elle est morte comme un rat ! ’ ”

but, after two verses of duologue, the young chevalier does not burst into tears of joy at the reappearance of his beloved—

“ Mais le jeune homme épouvanté
 Sur son cheval vite remontait,
 La liberté lui était trop chère !
 Et la pauvre fille dégoûtée
 N’avait qu’à reprendre sa route, et
 Son adresse est encore Leycesster Square.”

The same writer quotes a parody of Hiawatha in a little book of rhymes entitled “Phantasmagoria” by Lewis Carroll, published in 1869. It is entitled “Hiawatha’s Photographing.” I will quote a few lines of it, more especially as I limped along in that direction in a recent effort when I referred to my chief as “cambered and bright”:

“ From his shoulders Harold Nortik
 Took the camera of rosewood,
 Made of sliding, folding rosewood ;
 Neatly put it altogether.
 In its case it lay compactly,
 Folded into nearly nothing.
 But he opened out the hinges,
 Pushed and pulled the joints and hinges,
 Till it looked all squares and oblongs,
 Like a complicated figure
 In the Second Book of Euclid.
 This he perched upon a tripod,
 And the family in order
 Sate before him for their portraits.

Each in turn as he was taken
 Volunteered his own suggestions,
 His ingenious suggestions.
 First the Governor, the Father :
 He suggested velvet curtains,
 And the corner of a table,
 Of a rosewood dining-table.

He would contemplate the distance
 With a look of pensive meaning
 As of ducks that die in tempests.
 Grand, heroic was the notion,
 Yet the picture failed entirely,
 Failed, because he moved a little ;
 Moved, because he couldn’t help it.”

After failure with the mother,

“ Next the son, the Stunning-Cantab :
 He suggested curves of beauty,
 Curves pervading all his figure,
 Which the eye might follow onward
 Till they centred in the breastpin,
 Centred in the golden breastpin.
 He had learnt it all from Ruskin,
 Author of the *Stones of Venice*.”



Even this failed, as did that of the elder sister. Then the younger brother followed, and his portrait was so awful that—

“ In comparison the others
 Seemed to one’s bewildered fancy
 To have partially succeeded.”

The group presents a perfect likeness, whereupon they all abused it :

“ Really anyone would take us
 (Anyone that didn’t know us)
 For the most unpleasant people.
 Harold Nortik seemed to think so,
 Seemed to think it not unlikely.”

If I were called upon to stagger my audience with Macaulay’s “Horatius” I should do my best to totter up to the occasion. In fact, I have already attempted a fragment, which I append. I may preface that “Josephus” is the wholly imaginary manager of Aeronautics :

Josephus Bewsh, of Cherrytown,
 By all the powers he swore
 That though he had been bombed three times,
 He would be bombed no more.

* * *

They say he made strange conjuring tricks,
Which none could make but he;
And that queer things were in his house
Mysterious to see.

* * *

"To-night's the night!" they heard him yell.
He looked up to the sky:

The engine slick; then, passing quick,
Dropped cinders in his eye.

He pulled out strange disguises—

Uhlan and Prussian Guard—

"Ha! ha! a German waiter?"

But that is much too hard!"

* * *

And when the chaps foregather

In darkest war-time years,

When veterans with armlets

Arc spurning foolish fears;

When Bodega's port is opened,

And the gas is dimly lit,

And cigars are in the yappers' mouths,
And makes 'em turn to spit.

They tell how bold Josephus

Attained his great success,

And hoodwinked all the Germans

By donning evening dress!

After some such fashion one may hope to murder the classics. At the same time one will alienate most of one's friends. Seeing to what so-called friendship is being reduced, that will not greatly matter. All of which is a question of taste and opinion. Yet I hope I have made myself clear. We have arrived at a dumb age, and the deaf tell me that there is nothing so awful as silence. We are back to the story of Ung, and the saga has returned to its own. Let us plunge into the breach right away, for we, in our turn, shall be demoded, and the shining coin which the orphan boy will collect will be the purchase price of his master's retirement.

ON LEARNING TO FLY

MARY, m'darling, I'm thinking of you,
Now that I'm learning to traverse the blue,
Learning to turn out and shiver at dawn,
Heartily wishing I hadn't been born.
But—I'm an *Airman*! Just look at my clothes;
All you can see of me, dear, is my nose.
I've got a dandy suit—all leather skin—
Fitting so tightly I scarce can get in.
Helmets and goggles cost many a pound:
I'm quite the flying man—when on the ground.

Mary, m'darling, I'm thinking of you,
Thinking of Brighton, of tennis, of Sue!
Thinking of all the girls weeping for me
Now I no longer grace London-by-Sea.
Brighton without me—imagine it, pet!
How the poor taxis will wait with regret;
Music-halls there are as quiet as a mouse;
Creditors scrap on the steps of my house.

Mary, m'darling, I'm thinking of you,
Now I'm an *Airman* and traverse the blue.
Yesterday, dear, in a sixty-knot wind
I made some wonderful flights—in my mind.
When I descended my language grew worse,
Startled the dead in a neighbouring hearse,
Stopped all the clocks, put the crowd in a fright—
Everyone took me to be Grahame-White!

Mary, m'darling, do you think of me
Breaking height records and looping with glee?
If you do, dear, I've confessions to make—
Looping's my *hobby*, but not when awake.
No; when it's fine and when men leave the ground
I take good care that I'm not to be found;
Hasten to fly when the wind's getting worse,
Must give it up, so indulge in a curse.
Once I felt rash—yes, I started my "prop."
Needless to say, not to really get off.
Came back in haste and declared, "There's a miss!"
Ordered champagne, dear; and *that* led to this

"FLIGHT SUB."

The EFFECT of ACETYLENE on METALS

THE following notes on the effect of acetylene on metals appeared in the *Chemiker Zeitung*; the experiments were made by H. Reckleben and G. Scheiber.

Acetylene produced in the ordinary way was allowed to act for a period of twenty months at ordinary pressure and temperature on a great variety of metals. Three series of experiments were instituted. In the first, crude acetylene was conducted over the metals to be tested. In the second series the gas was previously purified, and in a third series it was also dried.

The following metals and alloys were tested:—Zinc, twenty months at ordinary pressure and temperature on a great variety of metals. Furthermore, three series of experiments were instituted. In the first, crude iron-bronze, phosphorus-bronze, and finally type-metal and soft solder. The last eight were in the form of shavings. The results of the action were as follows:—Pure dry acetylene had no effect on any of the metals tested; pure but moist acetylene caused no alteration in the appearance of any of the metals, but merely occasioned a slight increase of weight in copper and nickel; finally the gas, when both moist and impure, caused scarcely any alteration in tin, red-brass, palladium, aluminium-bronze, type-metal, and soft solder; but zinc, lead, brass, and nickel gained somewhat less than 1 per cent. in weight, while iron, art-bronze, and phosphor-bronze showed a gain in weight of 6.4 per cent. or 6 per cent. (*sic*) to 14.4 per cent., and also lost their metallic glitter and became black. But copper was the metal which was altered most and with the greatest rapidity; it not only gained heavily in weight, but became partially covered with a black crust. However, a minute examination showed that there was no formation of acetylene-copper, since the substance formed could not be exploded either by heat or by percussion. When the copper was treated with acid no acetylene was evolved, but traces of sulphureted hydrogen were perceived, and there remained a black "humoid" substance.

The same result was obtained when a copper tube was employed to conduct acetylene. The tube became stopped up while in use. The black powder which was scraped out of it had no explosive properties. It contained no calcium compounds, but was rich in carbon (Kohlenstoff).

Because of the above results, the authors advise the use of copper and its alloys in the installation of acetylene plants, since this precludes the danger of explosion. To avoid this they recommend plating with nickel or tin.



[By courtesy of]

LEST WE FORGET

[“ Winter’s Pie

(Or a winter’s morning in the R.N. Air Service)

BY LIEUT. E. G. O. BEUTTLER

THE WORK OF THE BRITISH AIR SERVICES—1914-1915

(From Official Despatches)

THE ROYAL NAVAL AIR SERVICE

Admiralty Report, September 23, 1914:—

"Yesterday (September 22) British aeroplanes of the Naval Wing delivered an attack on the Zeppelin sheds at Düsseldorf.

"The conditions were rendered very difficult by the misty weather, but Flight Lieutenant C. H. Collet dropped three bombs on the Zeppelin sheds, approaching within 400 ft. The extent of the damage done is not known. Flight Lieutenant Collet's machine was struck by one projectile, but all the machines returned safely to their point of departure. The importance of this incident lies in the fact that it shows that in the event of further bombs being dropped into Antwerp or other Belgian towns measures of reprisal can certainly be adopted if desired to almost any extent."

Admiralty Report, October 9, 1914:—

"Squadron Commander D. A. Spenser Grey, R.N., reports that as authorised he carried out, with Lieutenant R. L. G. Marix and Lieutenant S. V. Sippe, a successful attack on the Düsseldorf airship shed. Lieutenant Marix's bombs, dropped from 500 ft., hit the shed, went through the roof, and destroyed a Zeppelin. Flames were observed 500 ft. high, the result of igniting the gas of an airship. All three officers are safe, but their aeroplanes have been lost. The feat would appear to be in every respect remarkable, having regard to the distance—over a hundred miles—penetrated into country held by the enemy, and to the fact that a previous attack had put the enemy on their guard and enabled them to mount anti-aircraft guns."

Memorandum by the Director of the Air Department, Admiralty, October 11, 1914:—

"Commander Charles R. Samson, R.N., was in command of the Aeroplane and Armoured Motor Support of the Royal Naval Air Service (Naval Wing) at Dunkerque, between the dates September 1 to October 5.

"During this period several notable air reconnaissances were made and skirmishes took place. Of these particular mention may be made of the aeroplane attack on September 4, on four enemy cars and 40 men, on which occasion several bombs were dropped; and of the successful skirmishes at Cassel on September 4, Savy on September 12, Aniche on September 22, Orchies on September 23.

"On September 22, Flight Lieutenant C. H. Collet, of the Royal Naval Air Service (Naval Wing of the Royal Flying Corps), flying with a Sopwith tractor biplane, made a long flight and a successful attack on the German Zeppelin airship shed at Düsseldorf. Lieutenant Collet's feat is notable—gliding down from 6,000 feet, the last 1,500 in mist, he finally came in sight of the airship shed at a height of 400 feet, only a quarter of a mile away from it.

"Flight Lieutenant Marix, acting under the orders of Squadron Commander Spenser Grey, carried out a successful attack on the Düsseldorf airship shed during the afternoon of October 8. From a height of 600 feet he dropped two bombs on the shed, and flames 500 feet high were seen within 30 seconds. The roof of the shed was also observed to collapse. Lieutenant Marix's machine was under heavy fire from rifles and mitrailleuse, and was five times hit whilst making the attack.

"Squadron Commander Spenser Grey, whilst in charge of a flight of naval aeroplanes at Antwerp, penetrated during a 3½ hours' flight into the enemy country as far as Cologne on October 8. He circled the city under fire at 600 feet, and discharged his bombs on the military railway station. Considerable damage was done."

Admiralty Report, December 27, 1914:—

"On Thursday last, Squadron Commander Richard B. Davies, R.N., of the Naval Air Service, visited Brussels in a Maurice Farman biplane for the purpose of dropping

twelve bombs on an airship shed reported to contain a German Parseval. Eight of these bombs, of which six are believed to have hit, were discharged at the first attack and the remaining four on the return flight. Owing to the clouds of smoke which arose from the shed the effect could not be distinguished.

"On Friday, December 25, German warships lying in Schillig Roads, off Cuxhaven, were attacked by seven naval seaplanes, piloted by the following officers:—Flight Commander Douglas A. Oliver, R.N.; Flight Commander Francis E. T. Hewlett, R.N.; Flight Commander Robert P. Ross, R.N.; Flight Commander Cecil F. Kilner, R.N.; Flight Lieutenant Arnold J. Miley, R.N.; Flight Lieutenant Charles H. K. Edmonds, R.N.; Flight Sub-Lieutenant Vivian Gaskell Blackburn, R.N.

"The attack was delivered at daylight, starting from a point in the vicinity of Heligoland. The seaplanes were escorted by a light cruiser and destroyer force, together with submarines. As soon as these ships were seen by the Germans from Heligoland, two Zeppelins, three or four hostile seaplanes, and several hostile submarines attacked them. It was necessary for the British ships to remain in the neighbourhood in order to pick up the returning airmen; and a novel combat ensued between the most modern cruisers on the one hand and the enemy's aircraft and submarines on the other. By swift manœuvring the enemy's submarines were avoided, and the two Zeppelins were easily put to flight by the guns of the *Undaunted* and *Arethusa*. The enemy's seaplanes succeeded in dropping their bombs near to our ships, though without hitting any. The British ships remained for three hours off the enemy's coast without being molested by any surface vessel, and safely re-embarked three out of the seven airmen with their machines. Three other pilots who returned later were picked up, according to arrangement, by British submarines, which were standing by, their machines being sunk. Six out of the seven pilots, therefore, returned safely. Flight Commander Francis E. T. Hewlett, R.N., is, however, missing. His machine was seen in a wrecked condition about eight miles from Heligoland, and the fate of this daring and skilful pilot is at present unknown. The extent of the damage by the British airmen's bombs cannot be estimated, but all were discharged on points of military significance."

(Flight Commander Hewlett was rescued by a Dutch trawler and subsequently returned safely to England.)

Memorandum from the Director of the Admiralty Air Department, published on January 1, 1915:—

"December 17, 1914.

"On November 21, 1914, Squadron Commander E. F. Briggs, Flight Commander J. T. Babington, and Flight Lieutenant S. V. Sippe, Royal Navy, carried out an aerial attack on the Zeppelin airship sheds and factory at Friedrichshafen on Lake Constance. Leaving French territory shortly before ten a.m., they arrived over their objective at about noon, and, although under a very heavy rifle, machine-gun, and shrapnel fire from the moment they were sighted, they all three dived steeply to within a few hundred feet of the sheds, when they released their bombs—in all eleven. Squadron Commander Briggs was wounded, brought down, and made a prisoner, but the other two officers regained their starting point after a flight of more than four hours across hostile country under very bad weather conditions. It is believed that the damage caused by this attack includes the destruction of one airship and serious damage to the larger shed, and also the demolition of the hydrogen-producing plant, which had only lately been completed. Later reports stated that flames of considerable magnitude were seen issuing from the factory immediately after the raid."

Admiralty Report, January 23, 1915 :—

"On Friday, January 22, 12 or 13 German aeroplanes appeared over Dunkirk at 11.30 a.m. and dropped bombs. No particular damage was done, except that a shed in the docks was set on fire. One of the bombs fell just outside the United States Consulate, breaking all the windows and smashing the furniture. Belgian, French and British naval and military airmen engaged the German aeroplanes, one of which was brought down by a British military machine just over the Belgian frontier. The German aeroplane, pilot, and passenger were captured. During the day visits were paid to Zeebrugge by Squadron Commander Richard B. Davies and Flight Lieutenant Richard Peirse. Twenty-seven bombs were dropped on two submarines and on the guns on the mole. It is believed that one submarine was damaged considerably, and that many casualties were caused amongst the guns' crews. In making a reconnoitring flight before this attack Squadron Commander Davies was on one occasion surrounded by seven German aeroplanes, but managed to elude them. He was slightly wounded in the thigh on his way to Zeebrugge, but continued his flight, accomplished his mission, and is now progressing satisfactorily."

Admiralty Report, February 12 :—

"During the last 24 hours combined aeroplane and seaplane operations have been carried out by the Naval Wing in the Bruges, Zeebrugge, Blankenberghe, and Ostend districts, with a view to preventing the development of submarine bases and establishments. Thirty-four naval aeroplanes and seaplanes took part. Great damage is reported to have been done to Ostend railway station, which, according to present information has probably been burnt to the ground; the railway station at Blankenberghe was damaged and railway lines were torn up in many places. Bombs were dropped on gun positions at Middelkerke, also on the power station and German mine-sweeping vessels at Zeebrugge, but the damage done is unknown. During the attack the machines encountered heavy banks of snow. No submarines were seen. Flight Commander Grahame-White fell into the sea off Nieuport and was rescued by a French vessel. Although exposed to heavy gun fire from rifles, anti-aircraft guns, mitrailleuses, etc., all pilots are safe. Two machines were damaged.

"The seaplanes and aeroplanes were under the command of Wing Commander Samson, assisted by Wing Commander Longmore, Squadron Commanders Porte, Courtney, and Rathborne."

Admiralty Report, February 16 :—

"The air operations of the Naval Wing against the Bruges, Ostend-Zeebrugge district have been continued. This afternoon 40 aeroplanes and seaplanes bombarded Ostend, Middelkerke, Ghisteltes, and Zeebrugge. Bombs were dropped on the heavy batteries situated on the east and west sides of Ostend Harbour; on the gun positions at Middelkerke; on transport wagons on the Ostend-Ghisteltes road; on the Mole at Zeebrugge, to widen the breach damaged in former attacks; on the locks at Zeebrugge; on barges outside Blankenberghe; and on trawlers outside Zeebrugge.

"Eight French aeroplanes assisted the naval machines by making a vigorous attack on the Ghisteltes Aerodrome, thus effectively preventing the German aircraft from cutting off our machines. It is reported that good results were obtained.

"Instructions are always issued to confine the attacks to points of military importance, and every effort is made by the flying officers to avoid dropping bombs on any residential portion of the towns."

THE CUXHAVEN RAID

A supplement to the "London Gazette" issued on February 18 contained the following Admiralty Memorandum on the combined operations by H.M. ships and naval seaplanes on December 25, 1914 :

"On December 25, 1914, an air reconnaissance of the Heligoland Bight, including Cuxhaven, Heligoland, and Wilhelmshaven, was made by naval seaplanes, and the opportunity was taken at the same time of attacking with bombs points of military importance. The reconnaissance

involved combined operations by light cruisers, destroyers, and seaplane-carriers, under Commodore Reginald Y. Tyrwhitt, C.B., and submarines acting under the orders of Commodore Roger Keyes, C.B., M.V.O.

"The vessels detailed for the operations arrived at their rendezvous before daylight, and as soon as the light was sufficient the seaplanes were hoisted out and despatched. The following Air Service officers and observers took part in the reconnaissance :—Pilots—Flight Commander (now Squadron Commander) Douglas Austin Oliver, Flight Commander Francis Esme Theodore Hewlett, Flight Commander Robert Peel Ross, Flight Commander Cecil Francis Kilner, Flight Lieutenant (now Flight Commander) Arnold John Miley, Flight Lieutenant Charles Humphrey Kingsman Edmonds, Flight Sub-Lieutenant (now Flight Lieutenant) Vivian Gasken Blackburn; observers—Lieutenant Erskine Childers, R.N.V.R., C.P.O. Mechanic James W. Bell, C.P.O. Mechanic Gilbert H. W. Budds.

"The seaplane carriers were commanded by :—Squadron Commander Cecil J. L'Estrange Malone, Flight Commander Edmund D. M. Robertson, Flight Commander Frederick W. Bowhill.

"At the beginning of the flight the weather was clear, but on nearing the land the seaplanes met with thick weather, and were compelled to fly low, thus becoming exposed to a heavy fire at short range from ships and shore batteries. Several machines were hit, but all remained in the air for over three hours, and succeeded in obtaining valuable information regarding the disposition of the enemy's ships and defences. Bombs were also dropped on military points. In the meanwhile German submarines, seaplanes, and Zeppelins delivered a combined attack upon the light cruisers, destroyers, and seaplane-carriers, but were driven off.

"Flight Commanders Kilner and Ross and Flight Lieutenant Edmonds regained their ships. Flight Commander Oliver, Flight Lieutenant Miley, and Flight Sub-Lieutenant Blackburn became short of fuel, and were compelled to descend near Submarine *E. 11*, which with other submarine vessels was watching inshore to assist any seaplane that might be in difficulties. Lieutenant-Commander Martin E. Nasmith, commanding *E. 11*, although attacked by an airship, succeeded, by his coolness and resource, in rescuing the three pilots. Flight Commander Hewlett, after a flight of three and a half hours, was compelled to descend on account of engine trouble, but was rescued by a Dutch trawler, landed in Holland, and returned safely to England.

"An expression of their Lordships' appreciation has been conveyed to Commodore Keyes (Commodore S.), Commodore Tyrwhitt (Commodore T.), and to Captain Sueter (Director of the Air Department) for their share in the combined operations which resulted in this successful reconnaissance."

GERMAN EAST AFRICA—THE WRECK OF THE "KONIGSBERG"

Admiralty report, July 12, regarding the destruction of the "Königsberg" :—

"The position of the *Königsberg* was accurately located by aircraft, and as soon as the monitors were ready the operations were begun. On July 4 . . .

"As the *Königsberg* was surrounded by jungle the aeroplanes experienced very great difficulty in 'spotting' the fall of the shot. She was hit five times early in the action; but after the monitors had fired for six hours the aeroplanes reported that the *Königsberg's* masts were still standing. . .

"In order to complete the destruction of the *Königsberg* the Commander-in-Chief ordered a further attack on July 11, and a telegram has now been received from him stating that the ship is a total wreck."

The following are the extracts relating to the work of aerial scouting on the occasion of the destruction of the *Königsberg*, from Vice-Admiral King-Hall's official despatch published on December 9 :—

At 5.25 a.m. (on July 6) an aeroplane, with Flight-Com-

mander Harold E. M. Watkins as pilot, and carrying six bombs, left the aerodrome on Mafia Island. The bombs were dropped at the *Königsberg* with the intention of hampering any interference she might attempt with the monitors while they were getting into position.

At 5.40 a.m. another aeroplane, with Flight-Commander John T. Cull as pilot, and Flight Sub-Lieutenant Harwood J. Arnold as observer, left the aerodrome for the purpose of spotting for the monitors.

Returning to the operations of the monitors; fire was opened, as before stated, at 6.30 a.m., but as the *Königsberg* was out of sight it was very difficult to obtain satisfactory results, and the difficulties of the observers in the aeroplanes in marking the fall of the shots which fell amongst the trees were very great, and made systematic shooting most difficult.

There being only two aeroplanes available, considerable intervals elapsed between the departure of one and the arrival of its relief from the aerodrome 30 miles distant, and this resulted in a loss of shooting efficiency.

At 12.35 one of the aeroplanes broke down, and at 3.50 the second one also. I signalled to Captain Fullerton to move further up the river, which he did, until about 12.50 the tops of the *Königsberg's* masts were visible.

As it was necessary to make a fresh attack on the *Königsberg* to complete her destruction, further operations were carried out on July 11, by which date the aeroplanes were again ready for service, and the monitors had made good certain defects and completed with coal.

The observers in the aeroplanes, by their excellent spotting, soon got the guns on the target, and hit after hit was rapidly signalled. At 12.50 it was reported that the *Königsberg* was on fire.

I have much pleasure in bringing to the notice of their Lordships the names of the following officers and men:

Squadron Commander Robert Gordon, in command of the Air Squadron.

Flight Commander John T. Cull.

Flight Lieutenant Vivian G. Blackburn.

Flight Sub-Lieutenant Harwood J. Arnold.

Flight Lieutenant Harold E. M. Watkins.

Assistant Paymaster Harold G. Badger, H.M.S. *Hyacinth*. This officer volunteered to observe during the first attack on the *Königsberg*, though he had had no previous experience of flying.

Acting Lieutenant Alan G. Bishop, R.M.L.I., of H.M.S. *Hyacinth*. This officer volunteered to observe during the second attack on the *Königsberg*, though he had had no previous experience of flying.

Air Mechanic Ebenezer Henry Alexander Boggis, Chatham 14849, who went up on April 25 with Flight Commander Cull, and photographed the *Königsberg* at a height of 700 feet. They were heavily fired on, and the engine of the machine was badly damaged.

Most serious risks have been run by the officers and men who have flown in this climate, where the effect of the atmosphere and the extreme heat of the sun are quite unknown to those whose flying experience is limited to moderate climates. "Bumps" of 250 feet have been experienced several times, and the temperature varies from extreme cold when flying at a height to a great heat, with burning, tropical sun, when on land.

In the operations against the *Königsberg* on July 6 both the personnel and matériel of the Royal Naval Air Service were worked to the extreme limit of endurance. The total distance covered by the two available aeroplanes on that date was no less than 950 miles, and the time in the air, working watch and watch, was 13 hours. I will sum up by saying that the flying officers, one and all, have earned my highest commendations.

DARDANELLES OPERATIONS

In an Admiralty announcement issued on March 3 regarding the shelling of the Dardanelles forts, it was stated:—

"The operations in the Dardanelles were resumed at eleven o'clock on the morning of March 1, when His Majesty's

ships *Triumph*, *Ocean*, and *Albion* entered the Straits and attacked Fort No. 8 and the batteries at White Cliff. The fire was returned by the forts and also by field guns and howitzers. An air reconnaissance made by naval seaplanes in the evening reported that several new gun positions had been prepared by the enemy, but that no guns had been erected in them. The seaplanes also located a line of surface mines. During the same night a force of mine-sweepers, covered by destroyers, swept within a mile and a half of Cape Kephez, and their work, which was carried out under fire, is reported to have been excellent. . . .

"The next day seaplane reconnaissance was impossible on account of the weather."

In the announcement issued by the Admiralty on March 6 there was the following:—

"No action was possible on the 3rd until 2 p.m., when, although the weather was still unfavourable, *Irresistible*, *Albion*, *Prince George*, and *Triumph* resumed the attack on Fort Dardanus and the concealed guns in its neighbourhood. These were less active than before and were dealt with by the ships with more certainty. A useful seaplane reconnaissance located several encampments and two permanent batteries."

In the announcement issued by the Admiralty on March 8 there was the following:—

"Owing to the importance of locating the concealed guns the seaplanes have had to fly very low on occasions. On the 4th inst. a seaplane (pilot Flight Lieut. Garnett, observer Lieut.-Commander Williamson) became unstable and nosedived into the sea, both officers being injured. Flight Lieut. Douglas, reconnoitring at close quarters in another seaplane, was wounded, but managed to return safely. On the 5th seaplane No. 172 (pilot Flight Lieut. Bromet, with Lieut. Brown) was hit no fewer than twenty-eight times, and seaplane No. 7 (pilot Flight Lieut. Kershaw, with Petty Officer Merchant) eight times in locating concealed positions. The *Ark Royal* is equipped with every appliance necessary for the repair and maintenance of the numerous aircraft she carries."

The following announcement was issued by the Admiralty on March 9:—

"Wing Commander Longmore reports that an air attack on Ostend was carried out yesterday afternoon by six aeroplanes of the Naval Wing. Of these two had to return owing to the petrol freezing. The remainder reached Ostend and dropped eleven bombs on the submarine repair base and four bombs on the Kursaal, the headquarters of the military. All machines and pilots returned.

"It is probable that considerable damage was done. No submarines were seen in the basin.

"The attack was carried out in a fresh N.N.W. wind."

The Admiralty on March 9 communicated the following extract from "*Die Tijd*" (February 22, 1915):—

"The Raid of the British Airmen,

"Sluis, February 21.

"The general opinion of the public is that the raid of the British airmen was intended rather to obtain a moral effect than to cause material damage. I was of the same opinion until what I saw with my own eyes, and what I learnt from very reliable sources, made me change my mind. Besides the thirteen soldiers killed and the thirty-five wounded in the Blankenberghe tram, and the submarine badly damaged at Zeebrugge, several batteries along the coast have greatly suffered, and a large number of guns have been totally destroyed. At Knocke one officer and seven men were killed, as well as many artillerymen. The bombs did not kill any civilian nor touch any house."

Admiralty Report issued March 24, 1915:—

"The following has been received from Wing Commander Longmore:—

"I have to report that a successful air attack was carried out this morning (Wednesday, March 24) by five machines of the Dunkirk Squadron on the German submarines being constructed at Hoboken, near Antwerp. Two the pilots had to return owing to thick weather, but

Squadron Commander Ivor T. Courtney and Flight Lieut. H. Rosher reached their objective, and after planing down to 1,000 ft. dropped four bombs each on the submarines. It is believed that considerable damage has been done to both the works and two submarines. The works were observed to be on fire. In all five submarines were observed on the slip. Flight Lieut. B. Crossley-Meate was obliged by engine trouble to descend in Holland. Owing to the mist the two pilots experienced considerable difficulty in finding their way and were subjected to a heavy gun-fire whilst delivering their attack."

THE WORK OF THE ROYAL FLYING CORPS

EXTRACTS from Sir John French's despatches relating to the work of the Royal Flying Corps:—

MONS

From Field-Marshal Sir John French's despatch, September 7, 1914:—

"I wish particularly to bring to your Lordship's notice the admirable work done by the Royal Flying Corps under Sir David Henderson. Their skill, energy, and perseverance have been beyond all praise. They have furnished me with the most complete and accurate information, which has been of incalculable value in the conduct of the operations. Fired at constantly both by friend and foe, and not hesitating to fly in every kind of weather, they have remained undaunted throughout. Further, by actually fighting in the air, they have succeeded in destroying five of the enemy's machines."

THE AISNE

From Field-Marshal Sir John French's despatch, October 8, 1914:—

"In my despatch of September 7 I mentioned the name of Brigadier-General Sir David Henderson and his valuable work in command of the Royal Flying Corps, and I have once more to express my deep appreciation of the help he has since rendered me."

NEUVE CHAPELLE

(March 10, 11, and 12, 1915)

From Field-Marshal Sir John French's despatch, dated April 5, 1915:—

"The work of the Royal Flying Corps throughout this period, and especially during the operations of March 10, 11, and 12, was of the greatest value. Though the weather on March 10 and on the subsequent days was very unfavourable for aerial work on account of low-lying clouds and mist, a remarkable number of hours' flying of a most valuable character was effected, and continuous and close reconnaissance was maintained over the enemy's front. In addition to the work of reconnaissance and observation of artillery fire, the Royal Flying Corps was charged with the special duty of hampering the enemy's movements by destroying various points on his communications. The railways at Menin, Courtrai, Don, and Douai were attacked, and it is known that very extensive damage was effected at certain of these places. Part of a troop train was hit by a bomb, a wireless installation near Lille is believed to have been effectively destroyed, and a house in which the enemy had installed one of his headquarters was set on fire. These afford other instances of successful operations of this character. Most of the objectives mentioned were attacked at a height of only 100 to 150 feet. In one case the pilot descended to about 50 feet above the point he was attacking. . . ."

YPRES

Sir John French's despatch, dated June 15, published July 12:—

"Following a heavy bombardment, the enemy attacked the French Division at about five p.m. (on April 22), using asphyxiating gases for the first time. Aircraft reported that at about five p.m. thick yellow smoke had been seen issuing from the German trenches between Longemarck and Bixschoote. . . ."

"During the whole of May 4 the enemy heavily shelled the trenches we had evacuated, quite unaware that they

were no longer occupied. So soon as the retirement was discovered the Germans commenced to entrench opposite our new line and to advance their guns to new positions. Our artillery, assisted by aeroplanes, caused him considerable loss in carrying out these operations. . . ."

The following occurred in Sir Herbert Plumer's report to Sir John French of the fighting during the withdrawal after the gas attack round Ypres:—

"With the assistance of the Royal Flying Corps the 31st Heavy Battery scored a direct hit on a German heavy gun, and the North Midland Heavy Battery got on to some German howitzers with great success. . . ."

"The work performed by the Royal Flying Corps has been invaluable. Apart from the hostile aeroplanes actually destroyed, our airmen have prevented a great deal of aerial reconnaissance by the enemy, and have registered a large number of targets with our artillery."

"I have once more to call attention to the part taken by the Royal Flying Corps in the general progress of the campaign, and I wish particularly to mention the invaluable assistance they rendered in the operations described in this report [the second battle of Ypres], under the able direction of Major-General Sir David Henderson. The Royal Flying Corps is becoming more and more an indispensable factor in combined operations. In co-operation with the artillery, in particular, there has been continuous improvement both in the methods and in the technical material employed. The ingenuity and technical skill displayed by the officers of the Royal Flying Corps in effecting this improvement have been most marked. Since my last despatch there has been a considerable increase both in the number and in the activity of German aeroplanes in our front. During this period there have been more than sixty combats in the air, in which not one British aeroplane has been lost. As these fights take place almost invariably over or behind the German lines, only one hostile aeroplane has been brought down in our territory. Five more, however, have been definitely wrecked behind their own lines, and many have been chased down and forced to land in most unsuitable ground. In spite of the opposition of hostile aircraft, and the great number of anti-aircraft guns employed by the enemy, air reconnaissance has been carried out with regularity and accuracy. I desire to bring to your Lordship's notice the assistance given by the French Military Authorities, and in particular by General Hirschauer, Director of the French Aviation Service, and his assistants, Colonel Bouttieaux and Colonel Stammer, in the supply of aeronautical materials, without which the efficiency of the Royal Flying Corps would have been seriously impaired."

LOOS

The following passages relating to the Royal Flying Corps are from Sir John French's despatch issued on November 1:—

Describing the fighting on September 25:—

"The wing of the Royal Flying Corps attached to this Army (the Third) performed valuable work by undertaking distant flights behind the enemy's lines and by successfully blowing up railways, wrecking trains, and damaging stations on his line of communications by means of bomb attacks."

Later:—

"Heavy rain fell throughout the day, which was very detrimental to efficient observation of fire and reconnaissance by aircraft."

Referring to the co-operation of the Royal Flying Corps with artillery:—

"The work of the artillery in co-operation with the Royal Flying Corps continues to make most satisfactory progress, and has been most highly creditable to all concerned. The new weapons that have been placed in the field during the period under review have more than fulfilled expectations, and the enemy must be well aware of their accuracy and general efficiency."

"26. I would again call your Lordship's attention to the work of the Royal Flying Corps. Throughout the summer,

notwithstanding much unfavourable weather, the work of co-operating with the artillery, photographing the positions of the enemy, bombing their communications, and reconnoitring far over hostile territory has gone on unceasingly.

"The volume of work performed steadily increases; the amount of flying has been more than doubled during this period. There have been more than 240 combats in the air, and in nearly every case our pilots have had to seek the enemy behind his own lines, where he is assisted by the fire of his movable anti-aircraft guns; and in spite of this they have succeeded in bringing down four of the German machines behind our trenches, and at least twelve in the enemy's lines, and many more have been seen to dive to earth in a damaged condition or to have retired from the fight. On one occasion an officer of the Royal Flying Corps engaged four enemy machines and drove them off, proceeding on his reconnaissance. On another occasion two officers engaged six hostile machines and disabled at least one of them.

"Artillery observation and photography are two of the most trying tasks the Royal Flying Corps is called upon to perform, as our airmen must remain for long periods within easy range of the enemy's anti-aircraft guns. The work of observation for the guns from aeroplanes has now become an important factor in artillery fire, and the personnel of the two arms work in the closest co-operation. As evidence of the dangers our flying officers are called upon to face I may state that on one occasion a machine was hit in no fewer than 300 places soon after crossing the enemy's lines, and yet the officer successfully carried out his mission.

"The Royal Flying Corps has on several occasions carried out a continuous bombing of the enemy's communications, descending to 500 feet and under in order to hit moving trains on the railway. This has in some cases been kept up day after day; and during the operations at the end of September, in the space of five days, nearly six tons of explosives were dropped on moving trains, and are known to have practically wrecked five, some containing troops, and to have damaged the main railway line in many different places. For the valuable work carried out by the Royal Flying Corps I am greatly indebted to their commander, Brigadier-General H. M. Trenchard, C.B., D.S.O., A.D.C."

Order of the Day issued by Sir J. French, October 4, 1915

"THE Field-Marshal Commanding-in-Chief desires to express to Brigadier-General H. M. Trenchard, C.B., D.S.O., A.D.C., and all ranks of the Royal Flying Corps his appreciation of the valuable work they have performed during the battle which commenced on September 25. He recognises the extremely adverse weather conditions, which entailed flying under heavy fire at very low altitudes.

"He desires especially to thank pilots and observers for their plucky work, in co-operation with the artillery, in photography, and the bomb attacks on the enemy's railways, which were of great value in interrupting his communications.

"Throughout these operations the Royal Flying Corps have gallantly maintained the splendid record they have achieved since the commencement of the campaign."

HONOURS FOR THE BRITISH AIR SERVICES

Official Despatches, August 4, 1914—January 1, 1916

ROYAL NAVAL AIR SERVICE

DISTINGUISHED SERVICE ORDER

Commander C. R. SAMSON, R.N.; Squadron Commander S. D. A. GREY; Flight Lieut. R. L. G. MARIX; Lieut. C. H. COLLET, R.M.A.; Squadron Commander E. F. BRIGGS (January 1); Flight Commander J. T. BABINGTON (January 1); Flight Lieut. S. V. SIPPE (January 1); Capt. C. F. KILNER, R.M.L.I. (Flight Commander); Lieut. C. H. K.



SQ. COMM. GORDON, R.N.

EDMONDS, R.N. (Flight Lieut.), (February 18, 1915); Squadron-Commander R. B. DAVIES; Flight Lieut. R. E. C. PEIRSE (January 23, 1915); Squadron Commander A. W. BIGSWORTH, R.N. (August 26); Flight Lieut. GEORGE B. DACRE, R.N. (November 18); Squadron Commander R. GORDON, R.N.A.S. (December 28); Flight Commander JOHN T. CULL, R.N.A.S. (December 28); Flight Sub-Lieut. H. J. ARNOLD, R.N.A.S. (December 8, 1915); Flight Commander J. R. W. SMYTH-PIGOTT, R.N. (November 26).

VICTORIA CROSS

Flight Sub-Lieut. R. A. J. WARNEFORD, R.N. (June 8). For most conspicuous bravery on June 7, 1915, when he attacked and, single-handed, completely destroyed a Zeppelin in mid-air. This brilliant achievement was accomplished after

chasing the Zeppelin from the coast of Flanders to Ghent, where he succeeded in dropping his bombs on to it from a height of only one or two hundred feet. One of these bombs caused a terrific explosion, which set the Zeppelin on fire from end to end, but at the same time overturned his aeroplane and stopped the engine. In spite of this he succeeded in landing safely in hostile country, and after fifteen minutes started his engine and returned to his base without damage. (Awarded June 11, 1915.)

Squadron-Commander R. B. DAVIES, D.S.O., R.N.

The King has been graciously pleased to approve of the grant of the Victoria Cross to Squadron-Commander Richard Bell Davies, D.S.O., R.N., and of the Distinguished Service Cross to Flight Sub-Lieutenant Gilbert Formby Smylie, R.N., in recognition of their behaviour in the following circumstances:

On November 19 these two officers carried out an air attack on Ferrijik Junction. Flight Sub-Lieut. Smylie's machine was received by very heavy fire and brought down. The pilot planed down over the station, releasing all his bombs except one, which failed to drop, simultaneously at the station from a very low altitude. Thence he continued his descent into the marsh. On alighting he saw the one unexploded bomb, and set fire to his machine, knowing that the bomb would ensure its destruction. He then proceeded towards Turkish territory. At this moment he perceived Squadron Commander Davies descending, and fearing that he would come down near the burning machine and thus risk destruction from the bomb, Flight Sub-Lieut. Smylie ran back and from a short distance exploded the bomb by means of a pistol bullet. Squadron Commander Davies descended at a safe distance from the burning machine, took up Sub-Lieut. Smylie, in spite of the near approach of a party of the enemy, and returned to the aerodrome, a feat of airmanship that can seldom have been equalled for skill and gallantry.

LEGION OF HONOUR—CROIX DE CHEVALIER

(Conferred by the President of the French Republic)

Flight Sub-Lieut. R. A. J. WARNEFORD, R.N. (June 12).

DISTINGUISHED SERVICE CROSS

Flight Lieut. JOHN P. WILSON, R.N.; Flight Sub-Lieut. JOHN S. MILLS, R.N. (June 7); Lieut. T. D. HALLAM, R.N.V.R. (now Acting Flight Lieut., R.N.).

CONSPICUOUS GALLANTRY MEDAL

P.O. Mechanic JOHN H. RUSSELL, R.N.A.S.; P.O. Mechanic GEOFFREY C. P. RUMMING, R.N.A.S. (August 16).

DISTINGUISHED SERVICE MEDAL

C.P.O. Mechanic J. W. BELL; C.P.O. Mechanic G. H. BUDDS (February 18, 1915); Air Mechanic EBENEZER H. A. BOGGIS, O.N., 14349 (December 8, 1915).

ALBERT MEDAL (SECOND CLASS)

C.P.O. JAMES HENDRY, R.N.A.S. (May 27, 1915).

COMMENDED FOR SERVICE IN ACTION

Flight Lieut. G. R. BROMET, R.N.; Flight Lieut. R. HARGRAVE KERSHAW, R.N. (August 16).

CROSS OF THE COMMANDER OF THE LEGION OF HONOUR

(Conferred by the President of the French Republic)

Commodore M. F. SUETER, C.B., R.N., Superintendent of Aircraft Construction (November 23).

OFFICER OF THE ORDER OF THE CROWN OF BELGIUM

(Conferred by the King of the Belgians)

Wing Commander A. M. LONGMORE, R.N., Acting Commander R.N. (November 23).

ROYAL FLYING CORPS

THE VICTORIA CROSS

Second Lieut. W. B. RHODES-MOORHOUSE, Special Reserve, Royal Flying Corps.

For most conspicuous bravery on April 26, 1915, in flying to Courtrai and dropping bombs on the railway line near that station. On starting the return journey he was mortally wounded, but succeeded in flying thirty-five miles to his destination at a very low altitude, and reported the successful accomplishment of his object. He has since died of his wounds. (Awarded May 22, 1915.)

Capt. JOHN AIDAN LIDDELL, 3rd Bn. Princess Louise's (Argyll and Sutherland Highlanders) and R.F.C.

For most conspicuous bravery and devotion to duty on July 31, 1915. When on a flying reconnaissance over Ostend-Bruges-Ghent he was severely wounded (his right thigh being broken), which caused momentary unconsciousness, but by a great effort he recovered partial control after his machine had dropped nearly 3,000 ft., and notwithstanding his collapsed state, succeeded, although continually fired at, in completing his course and brought the aeroplane into our lines—half an hour after he had been wounded. The difficulties experienced by this officer in saving his machine and the life of his observer cannot be readily expressed; but as the control wheel and throttle control were smashed, and also one of the under-carriage struts, it would seem incredible that he could have accomplished his task. (Awarded August 25.)

Capt. LANOE GEORGE HAWKER, D.S.O., R.E. and R.F.C.

For conspicuous bravery and very great ability on July 25, 1915. When flying alone he attacked three German aeroplanes in succession. The first managed eventually to escape, the second was driven to ground damaged, and the third, which he attacked at a height of about 10,000 ft., was driven to earth in our lines, the pilot and observer being killed. The personal bravery shown by this officer was of the very highest order, as the enemy's aircraft were armed with machine-guns, and all carried a passenger as well as the pilot. (Awarded August 25.)

Second Lieut GILBERT STUART MARTIN INSALL, No. 11 Squadron, Royal Flying Corps.

For most conspicuous bravery, skill, and determination on November 7, 1915, in France. He was patrolling in a Vickers Fighting Machine, with First Class Air Mechanic T. H. Donald as gunner, when a German machine was sighted, pursued, and attacked near Achiet. The German pilot led the Vickers machine over a rocket battery, but with great skill Lieutenant Insall dived, and got to close range, when Donald fired a drum of cartridges into the German machine, stopping its engine. The German pilot then dived through a cloud, followed by Lieutenant Insall. Fire was again opened, and the German machine was brought down heavily in a ploughed field four miles south-east of Arras. On seeing the Germans scramble out of their machine and prepare to fire, Lieutenant Insall dived to 500 ft., thus enabling Donald to open heavy fire on them. The Germans then fled, one helping the other, who was apparently wounded. Other Germans then commenced heavy fire, but in spite of this Lieutenant Insall turned again, and an incendiary bomb was dropped on the German machine, which was last seen

wreathed in smoke. Lieutenant Insall then headed west in order to get back over the German trenches, but as he was at only 2,000 ft. altitude he dived across them for greater speed, Donald firing into the trenches as he passed over. The German fire, however, damaged the petrol tank, and, with great coolness, Lieutenant Insall landed under cover of a wood 500 yards inside our lines. The Germans fired some 150 shells at our machine on the ground, but without causing material damage. Much damage had, however, been caused by rifle fire, but during the night it was repaired behind screened lights, and at dawn Lieutenant Insall flew his machine home with First Class Air Mechanic T. H. Donald as a passenger.

DISTINGUISHED SERVICE ORDER

Capt. F. V. HOLT, Oxfordshire and Buckinghamshire Light Infantry (February 18, 1915); Lieut. (temporary Capt.) G. I. CARMICHAEL, R.A. and R.F.C. (March 27, 1915); Lieut. (temporary Capt.) G. F. PRETYMAN, Somerset Light Infantry and R.F.C. (March 27, 1915); Lieut. (temporary Capt.) D. S. LEWIS, R.E. and R.F.C. (January 1, 1915); Capt. and Brevet Major (temporary Lieut.-Col.) C. J. BURKE, Royal Irish Regt. (February 18, 1915); Capt. and Brevet Major J. M. SALMOND, Royal Lancaster Regt. (February 18, 1915); Capt. (temporary Major) H. MUSGRAVE, R.E. (February 18, 1915);



FL. COMM. D. CULL, D.S.O., R.N.

Lieut. (temporary Capt.) W. H. C. MANSFIELD, Shropshire Light Infantry (February 18, 1915); Lieut. H. D. HARVEY KELLY, Royal Irish Regt. (February 18, 1915); Lieut. G. W. MAPPLEBECK, Liverpool Regt. (February 18, 1915); Lieut. L. G. HAWKER, R.E. and R.F.C. (May 8, 1915); Brevet Major (temporary Lieut.-Col.) H. R. M. BROOKE-POPIHAM, Oxfordshire and Buckinghamshire Light Infantry (June 23, 1915); Capt. T. W. C. CARTHEW, Bedford Regt. (Special Reserve) (June 23, 1915); Capt. A. E. MORTON, The Black Watch (Royal Highlanders) (July 3, 1915); Capt. A. MARSHALL, 28th Light Cavalry, Indian Army, attached R.F.C. (July 3, 1915); Lieut. (temporary Capt.) G. L. CRUIKSHANK, Gordon Highlanders and R.F.C. (November 4, 1915); Lieut. (temporary Capt.) G. A. K. LAWRENCE, R.A. and R.F.C. (November 4, 1915).

MILITARY CROSS

Lieut. W. R. FREEMAN, Manchester Regt. and R.F.C. (March 27, 1915); Second Lieut. (temporary Capt.) L. A. STRANGE, Dorset Regt. and R.F.C. (March 27, 1915); Lieut. (temporary Capt.) A. H. L. SOAMES, 3rd Hussars and R.F.C. (January 1, 1915); Lieut. (temporary Capt.) C. W. WILSON, R.F.C., Special Reserve (January 1, 1915); Lieut. (temporary Capt.) E. L. CONRAN, 2nd Bn. City of London Regt. and R.F.C. (January 1, 1915); Capt. (temporary Major) G. S. SHEPARD, Royal Fusiliers (February 18, 1915); Second Lieut. R. A. ARCHER, R.A., attached R.F.C. (June 23, 1915); Lieut. (temporary Capt.) B. T. JAMES, R.E. (June 23, 1915); Lieut. (temporary Capt.) R. M. VAUGHAN, Royal Inniskilling Fusiliers (June 23, 1915); Lieut. (temporary Capt.) F. A. WANKLYN, R.A. (June 23, 1915); Lieut. G. L. CRUIKSHANK, Gordon Highlanders (June 23, 1915); Second Lieut. J. F. LASCELLES, Rifle Brigade (June 23, 1915); Second Lieut. O. D. FILEY, R.F.C., Special Reserve (July, 1915); Temporary Second Lieut. H. S. SHIELD, R.F.C. (October 2, 1915); Second Lieut. (temporary Capt.) A. A. B. THOMSON, Royal

Warwickshire Regt., attached R.F.C. (October 2, 1915); Lieut. (temporary Capt.) G. B. RICKARDS, R.F.C., Special Reserve (September 29, 1915); Capt. L. W. B. REES, R.A. and R.F.C. (September 29, 1915); Temporary Second Lieut. H. B. R. GRAY-EDWARDS, R.A. and R.F.C. (September 29, 1915); Second Lieut. S. H. LONG, Durham Light Infantry and R.F.C. (September 29, 1915); Second Lieut. D. A. C. SYMINGTON, R.F.C., Special Reserve (September 29, 1915); Lieut. (temporary Capt.) C. E. C. RABAGLIATI, The King's Own (Yorkshire Light Infantry) and R.F.C. (November 4, 1915); Temporary Second Lieut. A. M. VAUCOUR, R.F.A. and R.F.C. (November 4, 1915); Capt. R. LORAIN, R.F.C., Special Reserve (November 18, 1915); Temporary Lieut. the Hon. E. F. P. LUBBOCK, A.S.C., attached R.F.C. (November 18, 1915).

N.C.O.'s and Men

Sergt.-Maj. D. S. JILLINGS (January 1, 1915); Sergt.-Maj. J. RAMSAY (January 1, 1915); Sergt.-Maj. E. J. PARKER (January 1, 1915).

DISTINGUISHED CONDUCT MEDAL

Corp. S. C. GRIGGS, Second Class Air Mechanics H. D. BEET, H. DEWHURST, J. H. DOOLITTLE, and J. E. PRANCE (May 27, 1915); 1370 Sergt. R. H. CARR (now Second Lieut. in Special Reserve), 672 Corp. W. DOBBIE, 671 First Class Air Mechanic W. HARPER, 255 Flight Sergt. W. C. HAYWARD, 15 Flight Sergt. T. HUGHES, 1082 Corp. H. JAMESON, 1836 First Class Air Mechanic L. S. NEWNS, 836 Corp. R. E. P. PAYNTER, 1376 Sergt. E. R. C. SCHOLEFIELD (now



FL. SUB.-LT. GRAHAM, R.N.,
who destroyed a submarine

Second Lieut. in Special Reserve), 306 Flight Sergt. T. G. TINDALE (June 23, 1915); 1031 Corp. J. N. ROGERS, R.F.C. (August 5, 1915); 2726 Second Class Air Mechanic H. W. SUTCLIFFE, R.F.C. (August 5, 1915); Corp. T. BENNETT, R.F.C. (October 9, 1915); Staff Sergt. C. V. HEATH, Australian Flying Corps (October 9, 1915); Flight Sergt. J. HARGREAVES, R.F.C. (November 16, 1915).

LEGION OF HONOUR

(Conferred by the President of the French Republic)

Croix de Commandeur—Major-General Sir D. Henderson, K.C.B., D.S.O.

Croix d'Officier—Major J. F. Higgins, D.S.O., R.F.A.; Capt. and Brevet Major Brooke-Popham, Oxford and Bucks L.I.

Croix de Chevalier—Capts. Bonham-Carter, Northumberland Fusiliers; Charlton, Lancashire Fusiliers; Grey Warwick, R.H.A.; Shephard, Royal Fusiliers. Lieuts. Dawes, Middlesex Regt.; Lawrence, 7th Essex Regt. Reserve; Capt. Ellington, R.F.A., and Lieut. (temp. Capt.) James Valentine, R.F.C. (Special Reserve).

Médaille Militaire—Sergt.-Majors Bullen, Measures, Unwin; Sergts. Street, Taylor; Corps. C. R. Evans, Glid-don, Jenkins, Powell; First Class Air Mechanics Gardner, Jameson, McIntyre, Parker, Reffell.

RUSSIAN HONOURS FOR THE R.F.C.

In a supplement to the *London Gazette* (August 25) it was stated that:—

His Imperial Majesty the Emperor of Russia has been graciously pleased to confer, with the approval of His Majesty the King, the undermentioned rewards for gallantry and distinguished service in the field:

THE ORDER OF ST. GEORGE, FOURTH CLASS

Second Lieut. William Henry Dyke Acland, Royal 1st Devon Yeomanry (T.F.) (attached R.F.C.).

THE ORDER OF ST. ANNE, THIRD CLASS, WITH SWORDS

Major and Brevet Colonel Hugh Montague Trenchard, C.B., D.S.O., A.D.C., Royal Scots Fusiliers and R.F.C.

Major (temp. Lieut.-Colonel) Tom Ince Webb-Bowen, Bedfordshire Regt. and R.F.C.

THE ORDER OF ST. STANISLAS, THIRD CLASS, WITH SWORDS

Capt. and Brevet Major Charles Alexander Holcombe Longcroft, Welsh Regt. and R.F.C.

ORDER OF ST. ANNE, FOURTH CLASS, "FOR VALOUR IN WAR"

Second Lieut. Ivor Thomas Lloyd, South Wales Borderers and R.F.C.

CROSS OF THE ORDER OF ST. GEORGE, THIRD CLASS

Sergt. Sidney Charles Griggs, No. 5 Squadron, 2nd Wing, R.F.C.

Corp. Jack North Rogers, No. 1 Reserve A Squadron, Ad. Wing, R.F.C.

MEDAL OF ST. GEORGE, SECOND CLASS

Sergt. Edwin Cecil Rumford, No. 2 Squadron, 1st Wing, R.F.C.

MEDAL OF ST. GEORGE, THIRD CLASS

First Class Air Mechanic THOMAS HENRY SUTCLIFFE, No. 5 Squadron, No. 2 Wing, R.F.C.

ROYAL FLYING CORPS

Mentioned in Despatches, 1914

From Sir John French's despatch, October 8, 1914:—
Brevet Majors C. J. BURKE, R. Irish R.; C. A. LONGCROFT, Welsh R.; G. H. RALEIGH, Essex R.; J. M. SALMOND, R. Lancaster R.; F. H. SYKES (temp. Lieut.-Col.). Capts. R. A. BOGER, R.E.; A. J. BOURKE, Oxford and Bucks L.I.; A. B. BURDETT, York and Lancaster R.; G. W. DAWES, R. Berkshire R.; E. W. FURSE, R.F.A.; H. C. JACKSON, Bedford R.; F. F. WALDRON, 19th Hussars. Lieuts. K. P. ATKINSON, R.F.A.; I. M. BONHAM-CARTER, Northumberland Fus.; G. I. CARMICHAEL, R.F.A. (temp. Capt.); A. CHRISTIE, R.F.A.; E. L. CONRAN, 2nd Co. of London Yeo.; L. DAWES, Middlesex R.; H. D. HARVEY-KELLY, R. Irish R.; P. B. JOUBERT DE LE FERTE, R.F.A.; D. S. LEWIS, R.E.; W. H. MANSFIELD, Shrops. L.I.; G. W. MAPPLEBECK, 4th Liverpool R.; W. G. MITCHELL, H.L.I.; M. W. NOEL, Liverpool R.; C. E. RABAGLIATI, Yorks. L.I.; R. G. SMALL, Leinster R.; A. H. SOAMES, 3rd Hussars (temp. Capt.). Second Lieuts. N. C. SPRATT (S.R.); C. W. WILSON (S.R.); Sergt.-Majors D. JILLINGS, E. PARKER, J. RAMSAY. Flight-Sergts. C. CULLEN, H. GOODCHILD, A. SAYWOOD. Sergts. W. JONES, M. KEEGAN, A. WILSON. Corp. S. KEMP. All of R.F.C.

Mentioned in Despatches, 1915

From Sir John French's despatch, January 14, 1915:—
Majors A. D. CARDEN, R.E., J. F. HIGGINS, D.S.O., R.A. (temp. Lieut.-Col.); H. MUSGRAVE, R.E.; W. G. SALMOND, R.A.; Brevet Major J. H. BECKE, Notts. and Derby Regt. Capts. A. BORTON, R. Highlanders; R. CHOLMONDELEY, Rifle Brigade; F. J. COGAN, R.A.; H. HUGHES-HALLETT, N. Staffs. Regt.; A. C. MACLEAN, R. Scots (temp. Major); A. C. MARSH, R.A.; R. B. MARTYN, Wilts. Regt.; G. S. SHEPHARD, R. Fusiliers (temp. Major); G. E. TODD, Welsh Regt. Lieuts. R. O. ABERCROMBY, Gordon Highlanders (temp. Capt.); H. LE M. BROCK, R. Warwicks Regt. (temp. Capt.); E. F. CHINNER, Coldstream Guards (temp. Capt.—since killed); E. R. CORBALLIS, R. Dublin Fus. (temp. Capt.); G. N. HUMPHREYS (S.R.); B. T. JAMES, R.E. (temp. Capt.); H. J. ROCHE, R. Munster Fus. (temp. Capt.—since killed); A. SHEKELTON, R. Munster Fus.; F. G. SMALL, Connaught R. Second Lieuts. O. G. LYWOOD, Norfolk Regt.; G. J. MALCOLM, R.A.; L. A. STRANGE, Dorset Regt.; V. H. WADHAM, Hants. Regt.

Sir John French's despatch, dated May 31, published June 22:—

Brevet-Major B. H. BARRINGTON-KENNETT, Grenadier Guards (killed); Capt. R. J. F. BARTON, R. Scots Fus.; Capt. (temp. Major) W. D. BEATTY, R.E.; Lieut. W. C. K. BIRCH, Yorkshire Regt.; Brevet Major (temp. Lieut.-Col.) H. R. M. BROOKE-POPHAM, Oxfordshire and Buckinghamshire L.I.; Capt. T. W. C. CARTEW, 4th Bedfordshire Regt.; Capt.

R. G. CHERRY, R.A.; Capt. D. S. K. CROSBIE, Argyll and Sutherland Highlanders; Lieut. G. L. CRUIKSHANK, Gordon Highlanders; Lieut. (temp. Capt.) W. R. FREEMAN, Manchester Regt.; Lieut. H. M. HANKIN, Corps of Guides; Lieut. (temp. Capt.) L. G. HAWKER, D.S.O., R.E.; Capt. (temp. Major) F. V. HOLT, D.S.O., Oxfordshire and Buckinghamshire L.I.; Capt. G. B. HYNES, R.A.; Second Lieut. J. F. LASCELLES, Rifle Brigade; Lieut. (temp. Capt. in Army) C. F. LEE, West Somersetshire Yeomanry; Capt. E. R. LUDLOW-HEWITT, R. Irish Rifles; Lieut. (temp. Capt.) R. P. MILLS, R. Fusiliers; Lieut. A. E. MORGAN, 6th R. Fusiliers (killed); Capt. C. F. de S. MURPHY, R. Berkshire Regt.; temp. Lieut. E. W. POWELL; Lieut. (temp. Capt.) G. F. PRETYMAN, D.S.O., Somersetshire L.I.; Lieut. (temp. Capt.) C. E. C. RABAGLIATI, Yorkshire L.I.; Brevet Major G. H. RALEIGH, Essex Regt. (killed); Lieut. W. B. RHODES-MOORHOUSE, V.C. (S.R.) (died of wounds); Lieut. (temp. Capt.) H. J. A. ROCHE, R. Munster Fusiliers (killed); Lieut. C. B. SPENCE, R.A. (killed); Lieut. (temp. Capt.) J. E. TENNANT, Scots Guards; Brevet Lieut.-Col. H. M. TRENCHARD, C.B., D.S.O., R. Scots Fusiliers; Lieut. (temp. Capt.) R. M. VAUGHAN, R. Inniskilling Fusiliers; Lieut. (temp. Capt.) F. A. WANKLYN, R.A.; No. 556 Corp. A. BARTER; No. 944 Corp. T. G. BIRD; No. 546 Corp. C. R. S. EVANS; No. 1112 Flight Sergt. J. FULTON; No. 272 Sergt. E. J. P. KELLY; No. 270 Sergt.-Major J. MEAD; No. 173 Sergt.-Major S. J. PAYNE; No. 931 Sergt. E. C. RUMFORD; No. 72 Sergt. F. F. TAYLOR; No. 10 Sergt.-Major W. WADDINGTON; No. 191 Sergt. W. G. WEBB; No. 23 Sergt.-Major J. WILKINSON.

Dated November 30, 1915, issued January 1, 1916:—

Second Lieut. (temporary Lieut.) W. H. D. ACLAND, Royal 1st Devon Yeomanry; Lieut. (temporary Capt. in Army) W. C. ADAMSON, Special Reserve; Second Lieut. J. O. ANDREWS, Royal Scots; Lieut.-Col. E. B. ASHMORE, M.V.O., R.A.; Second Lieut. (temporary Capt.) P. BABINGTON, Hampshire Regt. (T.F.); Second Lieut. (temporary Lieut.) J. E. A. BALDWIN, 8th Hussars; Lieut. Hon. M. BARING, Special Reserve; Capt. V. A. BARRINGTON-KENNETT, Special Reserve; Lieut. (temporary Capt.) A. S. BARRATT, R.A.; Brevet Major (temporary Lieut.-Col.) J. H. W. BECKE, Notts and Derby Regt.; Capt. M. McB. BELL-IRVING, Special Reserve; Lieut. (temporary Capt.) W. C. K. BIRCH, Yorks Regt.; Capt. H. BLACKBURN, Special Reserve; Major A. G. BOARD, South Wales Borderers; Capt. (temporary Major) Hon. J. D. BOYLE, Rifle Brigade; Capt. C. R. S. BRADLEY, 4th Cavalry, I.A.; Brevet Lieut.-Col. W. S. BRANCKER, R.A.; Capt. H. Le M. BROCK, Royal Warwick Regt.; Brevet Major (temporary Lieut.-Col.) C. J. BURKE, D.S.O., Royal Irish Regt.; Second Lieut. E. BUSH, Special Reserve; Second Lieut. A. J. CAPEL, Somerset Light Infantry; Lieut. J. CEMLYN-JONES, Royal Welsh Fusiliers (T.F.); Major (temporary Lieut.-Col.) L. E. O. CHARLTON, D.S.O., Lancashire Fusiliers; Capt. A. CHRISTIE, R.A.; Temporary Capt. F. H. CLEAVER; Second Lieut. H. A. COOPER, Special Reserve; Lieut. (temporary Capt.) C. C. DARLEY, R.A.; Capt. temporary Major G. W. P. DAWES, Royal Berks Regt.; Capt. H. DE HAVILLAND, Special Reserve; Lieut. W. S. DOUGLAS, R.F.A., Special Reserve; Capt. (temporary Major) H. C. T. DOWDING, R.A.; Temporary Lieut. A. J. EVANS, Special List; Major F. L. FESTING, Northumberland Fusiliers; Lieut. O. D. FILLEY, Special Reserve; Second Lieut. E. M. GILBERT, Essex Regt., Special Reserve; Capt. H. F. GLANVILLE, West India Regt.; Second Lieut. D. A. GLEN, Manchester Regt.; Lieut. (temporary Capt.) E. L. GOSSAGE, R.A.; Capt. E. L. M. L. GOWER, Special Reserve; Temporary Second Lieut. B. P. GREENWOOD, Special List; Lieut. (temporary Capt.) E. O. GREN-

FELL, R.A.; Temporary Second Lieut. H. B. R. GREY-EDWARDS, R.A.; Capt. J. G. HEARSON, R.E.; Lieut. (temporary Capt. in Army) F. E. HELLIER, Hampshire Regt. (T.F.); Brevet Lieut.-Col. (temporary Brig.-Gen.) J. F. A. HIGGINS, D.S.O., R.A.; Temporary Capt. E. D. HORSFALL; Temporary Second Lieut. E. L. HYDE; Temporary Second Lieut. A. J. INSALL; Capt. J. L. JACKSON, Connaught Rangers, Special Reserve; Lieut. (temporary Capt.) B. T. JAMES, R.E. (killed); Lieut. (temporary Capt.) J. L. KINNEAR, Liverpool Regt.; Lieut. (temporary Capt.) G. A. K. LAWRENCE, D.S.O., R.A.; Capt. (temporary Major) D. S. LEWIS, D.S.O. R.E.; Second Lieut. S. H. LONG, Durham Light Infantry; Brevet Major (temporary Lieut.-Col.) C. A. H. LONGCROFT, Welsh Regt.; Major R. LONGSTAFF, R.F.A.; Capt. R. LORAIN, Special Reserve; Temporary Lieut. Hon. E. F. P. LUBBOCK, A.S.C.; Capt. (temporary Major) E. R. LUDLOW-HEWITT, Royal Irish Rifles; Capt. A. MARSHALL, D.S.O., 28th Cavalry, I.A.; Temporary Second Lieut. H. W. MEDLICOTT; Lieut. (temporary Capt.) G. D. MILLS, Notts and Derby Regt.; Capt. W. G. S. MITCHELL, Highland Light Infantry; Second Lieut. (temporary Capt.) E. H. MITCHELL, R.A.; Capt. J. T. C. MOORE-BRABAZON, Special Reserve; Lieut. (temporary Capt. in Army) H. R. NICHOLL, Special Reserve; Temporary Lieut. A. H. PARKER (Lieut., Punjab V.R.); Temporary Second Lieut. R. H. PECK, Dorset Regt.; Lieut. (temporary Capt. in Army) R. M. PIKE, Special Reserve; Second Lieut. J. C. W. A. PINNEY, Royal Fusiliers; Lieut. (temporary Capt.) P. H. L. PLAYFAIR, R.A.; Major G. L. POPHAM, R.A.; Capt. G. T. PORTER, R.A.; Capt. (temporary Lieut. in Army) E. W. POWELL, Unattached List (T.F.); Temporary Lieut. F. J. POWELL; Qmr. and Hon. Lieut. (temporary Capt.) J. RAMSAY; Lieut. (temporary Capt.) W. R. READ, 1st Dragoon Guards; Capt. L. W. B. REES, R.A.; Brevet Major H. R. P. REYNOLDS, R.E.; Second Lieut. R. S. RUMBOLD, Somerset Light Infantry; Temporary Lieut. J. C. RUSSELL, R.E. (Second Lieut., R.E., (T.F.)); Lieut. (temporary Capt.) C. E. RYAN, R.F.A.; Major (temporary Lieut.-Col.) W. G. H. SALMOND, R.A.; Brevet Major (temporary Lieut.-Col.) J. M. SALMOND, D.S.O., Royal Lancashire Regt.; Temporary Lieut. R. A. SAUNDERS, R.F.A. (T.F.); Second Lieut. E. R. C. SCHOLEFIELD, Lancashire Fusiliers; Capt. (temporary Major) G. S. SHEPARD, Royal Fusiliers; Temporary Second Lieut. H. S. SHIELD; Lieut. (temporary Capt.) F. W. H. SIMPSON, R.G.A.; Second Lieut. H. R. D. SIMPSON, 6th Dragoons; Temporary Lieut. H. M. SISON, A.S.C.; Capt. T. V. SMITH, Special Reserve; Lieut. A. SOMERVAIL, King's Own Scottish Borderers (T.F.); Capt. N. C. SPRATT, Special Reserve; Lieut. J. V. STEEL, R.G.A.; Second Lieut. D. A. C. SYMINGTON, Special Reserve; Second Lieut. (temporary Capt.) A. A. B. THOMSON, Royal Warwick Regt.; Second Lieut. H. R. VAGG, Somersetshire Light Infantry; Temporary Second Lieut. A. M. VAUCOIR, R.F.A.; Lieut. (temporary Capt.) R. H. VERNEY, A.S.C.; Major (temporary Lieut.-Col.) T. I. WEBB-BOWEN, Bedfordshire Regt.; Second Lieut. J. W. WOODHOUSE, Special Reserve; Second Lieut. L. W. YULE, Special Reserve; 297 Acting Serg.-Maj. J. P. ANGELL; 160 Serg. A. W. ARMSTRONG; 1983 Serg. A. ARMSTRONG; 555 Serg. A. A. J. BEER; 348 Serg. H. E. BETHELL; 812 Flight Serg. G. BROWN; 728 Corp. G. S. CHAPMAN; 1164 First Class Air Mechanic W. ELSTOW; 1025 Corp. A. HAWLEY; 208 Acting Serg.-Maj. A. HUNTER; 586 Flight Serg. W. C. IBBOTT; 152 Flight Serg. F. JAMES; 346 Acting Serg.-Maj. M. KEEGAN; 272 Flight Serg. E. J. P. KELLY; 1053 Corp. E. J. A. KNIGHT; 1443 Flight Serg. T. C. NOBLE; 1629 Serg. A. RANDLE; 144 Serg. W. SMITH; 635 First Class Air Mechanic P. M. VEITCH; 248 Acting Serg.-Maj. H. WOODS.

CASUALTIES IN THE AIR SERVICES, 1914-1915

Names marked with an asterisk are those of service members who did not die on active service in the field

ROYAL NAVAL AIR SERVICE

August, 1914—December 31, 1914.

KILLED

ANNESLEY, Lord (November 5).
ASH, Flight Lieut. B. D., R.N. (September 29).
BEEVOR, Lieut. F., R.N. (November 5).
COLLIER, First Class Air Mechanic F. 48, T. D. (October 31).
*FFIELD, Sub-Lieut. B. O., R.N. (December 24).
GATES, Flight Lieut. R. T. (September 14).
*MURRAY, Sub-Lieut. P. B., R.N. (November 5).
VERNON, Flight Lieut. H. D., R.N. (September 29).

PRISONER OF WAR

BRIGGS, Squadron Commander E. F., R.N. (November 21).

Casualties.—January 1, 1915—December 31, 1915.

KILLED

ALEXANDER, Flight Sub-Lieut. J. M., R.N. (September 12).

*ARMITAGE, Prob. Flight Sub-Lieut. G. G. A., R.N. (December 12).

BARNES, Flight Lieut. Douglas M., R.N. (June 1).

BASTOW, Second Lieut. W. H., R.F.A., attd. R.N.A.S. (November 26).

BATCHELOR, Flight Sub-Lieut. H. J., R.N. (May 11).

BONE, Flight Sub-Lieut. John T., R.N. (October 18).

COLLET, Capt. C. H., D.S.O., R.M.A. (Flight Commander, R.N. (August 19).

CROUCHER, Flight Sub-Lieut. W., R.N. (September 18).

DOWNING, Lieut. D. C., R.N. (February 25).

GORDON-RIGGALL, Flight Lieut. E., R.N. (February 16).

HAY, Prob. Flight Sub-Lieut. Douglas A., R.N. (September 20).

HILLIARD, Flight Sub-Lieut. G. W., R.N. (September 8).

HUGHES, Flight Sub-Lieut. B. F. M., R.N. (December 1).
 JOHNSTON, Flight Lieut. D. K., R.N. (August 10).
 *JOHNSTON, Flight Sub-Lieut. M. K., R.N. (September 12).
 LORD, Flight Lieut. R., R.N. (August 10).
 *McLARTY, Flight Sub-Lieut. John, R.N. (August 24).
 *MEDLOCK, Flight Sub-Lieut. S., R.N. (April 26).
 *PIZEY, Flight Sub-Lieut. C. P., R.N. (June 11).
 ROSE, Flight Sub-Lieut. John H., R.N. (November 26).
 *SHEPHERD, Flight Sub-Lieut. A. G., R.N. (March 11).
 WANKLYN, Flight Lieut. H. G., R.N. (May 31).
 WARNEFORD, Flight Sub-Lieut. R. A. J., R.N., V.C. (June 17).

WATSON, Flight Lieut. K. F., R.N. (August 3).
 *WATSON, Flight Sub-Lieut. P. A., R.N.A.S. (June 30).

PRISONERS OF WAR

DALZELL, Flight Sub-Lieut. W. A. K., R.N. (July 29).
 DOLLING-SMITH, Sub-Lieut. C. H., R.N.V.R. (July 29).
 LEVY, Flight Lieut. John M. D'A., R.N. (August 12).
 McKEAN, Flight Lieut. L. D., R.N. (October 19).
 PETTER, Flight Sub-Lieut. R. C., R.N. (September 23).
 RAINEY, Flight Lieut., R.N. (interned in Holland).
 SHIELDS, Second Grade Air Mechanic H. G. (November 16).

MISSING

BESSON, Flight Sub-Lieut. Frank, R.N. (December 20).
 O'BRIEN, Flight Sub-Lieut. Hon. D., R.N. (February 16).
 GROVES, Prob. Flight Sub-Lieut. John O., R.N. (May 14).
 ROBINSON, Flight Commander C. E., R.N. (Capt., R.M.L.I.) (December 10).
 SPENCER, Flight Sub-Lieut. T., R.N. (February 16).

KILLED

*HUGHES, Air Mechanic H. (April 26).
 *BRANDON, Air Mechanic W. C. (December 2).

ROYAL FLYING CORPS

August, 1914—December 31, 1914

KILLED

*BARLOW, Air Mechanic R. K. (August 12).
 BAYLY, Lieut. C. G. G., R.F.C. (August 22).
 *BUSK, Lieut. E. T. (November 5).
 CREAM, Capt. T., Northamptonshire Regt. and R.F.C. (October 26).
 *FLEMING, Lieut. H. R., R.F.C. (November 24).
 GEARD, Corp F. J. P. (August 18).
 HOSKING, Lieut. C. G., R.F.A. and R.F.C. (October 26).
 PARFITT, Air Mechanic H. E. (August 16).
 COPLAND-PERRY, Lieut. E. W., R.F.C. (August 16).
 *SKENE, Lieut. R. R., R.F.C. (August 12).
 WARLOW, Capt. PICTON, R.F.C. (December 20).
 WATERFALL, Second Lieut. V., R.F.C. (August 22).

PRISONERS OF WAR

BOGER, Capt. Robert, R.E., attached R.F.C. (October 5).
 GRAY, Capt. Robin, R.F.C. (October 5).
 LINDOP, Lieut. V. S. E., R.F.C. (September 19).
 MAYNE, Lieut. H. G. L., K.O.S.B. and R.F.C.
 RAWSON-SHAW, Lieut. K., R.F.A. and R.F.C.

Casualties—January 1, 1915—December 31, 1915

KILLED

ADAMS, Capt. T. D., R.F.A., attd. R.F.C. (November 7).
 ADAMSON, Capt. W. C., R.F.C. (September 5).
 *ARKWRIGHT, Capt. F. G. A., R.F.C. (October 14).
 BARFIELD, Second Lieut. J. C. H., R.F.C. (June 29).
 *BARRINGTON-KENNETT, Major B. H., Grenadier Guards (May 20).
 BEWES, Lieut. R. C. H., Liverpool Regt., attd. R.F.C. (May 23).
 *BLOOD, Capt. B., R.F.C. (September 24).
 BOLES, Second Lieut. H. F., 17th Lancers, attd. R.F.C. (May 25).
 BRADDYLL, Lieut. E. C., 10th Lancers, attd. R.F.C. (September 5).
 BRAITHWAITE, Lieut. M. L., R.F.A., attd. R.F.C. (May 17).

CAWS, Lieut. S. C., R.F.C. (September 22).
 CHINNERY, Capt. E. F., R.F.C. (January 18).
 CHOLMONDELEY, Capt. R., Rifle Brigade and R.F.C. (March 12).
 CLARKE, Lieut. B. L., 23rd Cavalry and R.F.C.
 *COCKERELL, Lieut. S. P., R.F.C. (March 20).
 CORBETT-WILSON, Lieut. D., R.F.C. (May 15).
 *CROFT, Second Lieut. C. T. B., 8th Somerset L.I., attd. R.F.C. (December 8).
 FOX, Capt. A. G., R.E. and R.F.C. (May 9).
 *FULTON, Lieut.-Col. J. D. B., R.F.A. and R.F.C. (November 11).
 *GARDNER, Second Lieut. M. L., R.F.C. (January 19).
 GAY, Second Lieut. J., R.F.C. (October 10).
 *HARDY, Lieut. Allan, R.F.C. (October 14).
 HARVEY, Lieut. G. F., R.F.A., attd. R.F.C. (November 8).
 *HOBBS, Lieut. G., R.F.C. (September 7).
 HYLAND, Second Lieut. F. H., Yorks Regt., attd. R.F.C. (May 23).
 IRVING, Second Lieut. A. G., R.E. and R.F.C. (March 10).
 *IRVING, Lieut. Bell, R.F.C. (October 26).
 JAMES, Second Lieut. B. G., R. Lancashire Regt., attd. R.F.C.
 JAMES, Capt. B. T., R.E. and R.F.C. (July 13).
 JOHNSTONE, Lieut. J. A., R.F.A., attd. R.F.C. (May 20).
 *KANE, Capt. J. F. A., R.F.C. (March 22).
 KELWAY-BAMBER, Second Lieut. C. H., R.F.C. (November 11).
 LASCELLES, Second Lieut. J. F., 2nd Rifle Brigade and R.F.C. (August 1).
 LAWRENCE, Capt. W., R.F.C. (January 2).
 LE BAS, Lieut. O. V., R. West Surrey and R.F.C. (November 7).
 LIDDELL, Capt. J. A., R.F.C., V.C. (August 31).
 LISTER, Lieut. E., R.F.C.
 *LUMSDEN, Major H. T., R.F.C. (June 21).
 *MAPPLEBECK, Capt. G. W., R.F.C. (August 24).
 MARKS, Capt. C. H., R.F.C. (October 23).
 MONCKTON, Second Lieut. M. H., R.G.A. and R.F.C. (July 10).
 MORGAN, Lieut. A. E., R. Fusiliers and R.F.C. (March 10).
 *MORKILL, Lieut. R. F., E. Yorks Regt., attd. R.F.C. (June 22).
 *MULLINS, Second Lieut. J. O., R.F.C. (March 29).
 McCONNOCHIE, Second Lieut. W. J., R.F.C. (November 8).
 MACDONNELL, Capt. H. C., R. Irish Regt., attd. R.F.C. (May 22).
 NEWTON, Capt. A. V., Somerset L.I., attd. R.F.C. (October 20).
 NIXON, Lieut. W. H., King's Own (R. Lances) and R.F.C.
 PARKER, Second Lieut. J., King's Own (R. Lances) and R.F.C. (August 6).
 PIKE, Capt. R. M., 14th Hussars, attd. R.F.C. (August 9).
 PLAYFAIR, Lieut. L., 1st Royal Scots and R.F.C. (July 6).
 POKHAMPTON, Second Lieut. F. W., R.F.C. (April 26).
 RALEIGH, Major G. H., Essex Regt. and R.F.C. (January 20).
 RHODES-MOORHOUSE, Second Lieut. W. B. R., R.F.C., V.C. (April 27).
 RICH, Capt. C. S., R.F.A., attd. R.F.C. (March 26).
 ROCHE, Capt. H. J. A., R. Munster Fusiliers and R.F.C. (January 19).
 RODNEY, Second Lieut. Hon. W. F., Rifle Brigade and R.F.C. (May 10).
 RUSSELL, Lieut. P. C. S., Cameronians (Scottish Rifles), 5th Bn. (T.F.), and R.F.C.
 *SHARPE, Lieut. W. F., Canadian R.F.C. (February 4).
 *SMITH, Capt. H. D. D., R.F.C. (December 14).
 *SOAMES, Capt. R. H. L., R.F.C. (July 7).
 *SPENCE, Lieut. C. B., R.F.A. and R.F.C. (May 9).
 TALLENTIRE, Second Lieut. R. T., Artists' Rifles, attd. R.F.C. (October 20).
 WALLACE, Second Lieut. W. H., 5th Rifle Brigade, attd. R.F.C. (September 9).
 WARRAND, Lieut. A. St. J. N., Black Watch and R.F.C.

WASHINGTON, Second Lieut. J. N., Manchester Regt. and R.F.C. (September 26).

*WILSON, Lieut. A. C., R.F.C. (August 17).

WILSON, Lieut. W. C., 1st Worcester, attd. R.F.C.

WOODIWISS, Second Lieut. I. N., Lincoln Regt. and R.F.C.

PRISONERS OF WAR

ATKINS, Capt. B. S., 11th Rajputs, attd. R.F.C. (September 25).

BINNEY, Capt. F. B., R.F.A. and R.F.C. (September 27).

BRODER, Lieut. P. A., 5th Worcester and R.F.C. (August 1).

BROWN, Second Lieut. A. W., 3rd Manchester, attd. R.F.C.

BUCKLEY, Lieut. S. E., 5th Northampton Regt., attd. R.F.C. (December 1).

BURNIE, Second Lieut. A. L., 8th East Kent Regt., attd. R.F.C. (November 15).

CHIDSON, Second Lieut. M. R., R.G.A. and R.F.C. (March 1).

COLLIER, Lieut. A. C., R. Lancs. Regt., attached R.F.C.

CRABBIE, Second Lieut. W. M., R.F.A. and R.F.C. (July 15).

CROSBIE, Capt. D. S. K., Argyll and Sutherland Highlanders and R.F.C. (May 2).

DARLEY, Capt. C. C., R.F.A. and R.F.C.

DAVIES, Second Lieut. T. E. H., K.R.R.C. and R.F.C. (March 21).

DRURY, Second Lieut. D. D., Int. Corps, attd. R.F.C. (August 17).

EBERLI, Lieut. F. H., R.G.A., attd. R.F.C.

FULTON, Second Lieut. E. J., 1st Lancers, attd. R.F.C. (November 22).

GLADSTONE, Lieut. C. A., Int. Corps, attd. R.F.C. (April 30).

GREENHOW, Second Lieut. M. W., W. Yorks Regt. and R.F.C. (September 26).

GRINNELL-MILNE, Lieut. D. W., R. Fusiliers, attd. R.F.C. (December 2).

HUMPHREYS, Lieut. G. N., R.F.C. (March 21).

LEECH, Capt. J. C., 8th Hussars, attd. R.F.C.

LEESON, Lieut. D., 7th Infantry, attd. R.F.C.

MACPHERSON, Second Lieut. R. C., Black Watch and R.F.C. (August 2).

MANSELL-MOULLIN, Second Lieut. O., R.F.C. (March 12).

MEDLICOTT, Second Lieut. H. W., R.F.C.

MULCAHY-MORGAN, Capt. T. W., R. Irish Fusiliers and R.F.C. (September 12).

PAUL, Lieut. Sir R. J., R.F.C.

REID, Second Lieut. W., R.F.C. (August 2).

REILLY, Major H. L., 82nd Punjabs, attd. R.F.C.

ROBINSON, Second Lieut. J. B., R.F.C.

*ROGERS, Lieut. W. F., R.F.C. (December 29).

SANDERS, Second Lieut. D. C. W., R.F.A. and R.F.C. (March 1).

SCHOLEFIELD, Second Lieut. E. R. C., R.F.C.

SLADE, Second Lieut. R. J., Army Cyclist Corps, attd. R.F.C.

SPRATT, Capt. N. C., R.F.C.

STUBBS, Second Lieut. H. B., R.F.C.

SUGDEN-WILSON, Lieut. W. H., Somerset Yeomanry, attd. R.F.C.

TRELOAR, Capt. W. N., Australian R.F.C.

WALKER, Lieut. E. G. S., R.F.C. (July 6).

WARD, Second Lieut. H. S., R.F.C. (December 1).

WEIR, Lieut. A. J., R.F.C. (July 28).

WHITE, Capt. T. W., Australian Flying Corps.

WILKIN, Second Lieut. B., Duke of Cornwall's L.I., attd. R.F.C.

WILSON, Capt. J. F. C., R.F.C.

WILSON, Lieut. S., R.F.C.

YEATS-BROWN, Capt. F. C. C., 17th Cavalry, attd. R.F.C.

INTERNED IN HOLLAND

ADAMS, Second Lieut. A. T. P., R.F.C. (July 6).

FERTE, Second Lieut. J. C. Joubert de la, R.F.C.

FRYER, Capt. F. E., R.G.A. and R.F.C.

GAYE, Capt. A. D., 1st Bedford Regt. and R.F.C.

HODGSON, Lieut. E. E., R.F.C. (June 6).

HUNT, Capt. R. E. B., Shropshire L.I., attd. R.F.C. (August 1).

JACKSON, Lieut. F. H., R. Sussex Regt., attd. R.F.C. (August 1).

MEAKIN, Second Lieut. G. E. R., R.F.C. (July 6).

MORRELL, Lieut. C. M., R. Munster Fusiliers, attd. R.F.C. (June 6).

PRICHARD, Capt. F. H., R.G.A. and R.F.C.

VEITCH, Lieut. D. M. V., 1st Lancers, attd. R.F.C.

MISSING

BROWNE, Second Lieut. A. R. H., R.F.C. (December 6).

BURN, Lieut. W. W. A., R.F.C. (believed killed, August 23).

GALLIE, Second Lieut. C., R. Scots Fusiliers, attd. R.F.C. (August 23).

GOODE, Second Lieut. H. M., 2nd City of London Yeomanry, attd. R.F.C. (July 15).

GRANTHAM, Second Lieut. V. M., R.F.C. (November 12).

HANKIN, Lieut. H. M., Qn. Victoria's Own Corps of Guides, attd. R.F.C.

HARVEY, Lieut. W. A., Norfolk Regt., attd. R.F.C. (November 12).

HELLYER, Lieut. F. E., Hampshire Regt. and R.F.C. (September 27).

HOBBS, Second Lieut. A. V., R.F.C. (December 16).

HOWEY, Second Lieut. J. E. P., Bedford Yeomanry, attd. R.F.C. (November 12).

INSALL, Second Lieut. G. S. M., R.F.C. (December 15).

LAWRENCE, Second Lieut. W. G., 3rd Oxford and Bucks L.I., attd. R.F.C.

MERZ, Lieut. G. P., R.F.C. (believed killed; August 23).

MCCLEAN, Second Lieut. W. A., Black Watch, attd. R.F.C.

PORTER, Lieut. G. A., R.F.A. and R.F.C. (December 6).

SANFORD, Lieut. S. A., 7th Dragoon Guards and R.F.C. (May 10).

STRONG, Capt. C. C., 13th London Regt. (Kensington T.F.), attd. R.F.C. (December 2).

TUDOR-JONES, Second Lieut. T. E. C., E. Lancs. Regt., attd. R.F.C. (December 16).

YULE, Second Lieut. L. W., R.F.C. (September 27).

KILLED

BAÑNISTER, 1st Class Air Mech. G. S. (June 6).

†BARKER, 534 1st Class Air Mech. W. (March 18).

BARNARD, Serg. B. (August 21).

†BOWYER, 582 Corp. A. (March 18).

BURNS, Flight Serg. W.

†COOK, 589 1st Class Air Mech. G. (March 18).

†COSTIGAN, 194 Flight Serg. J. (March 18).

†CUFF, 1192 2nd Class Air Mech. A. (March 18).

ELDRIDGE, 3329 2nd Class Air Mech. H. G. (June 21).

HANLEY, 1813 1st Class Air Mech. (May 13).

HAWKINS, 1307 2nd Class Air Mech. A. C. (March 11).

LISTER, 2nd Class Air Mech. E. (July 6).

†MORGAN, 872 1st Class Air Mech. A. (March 18).

*MCCUDDEN, Flight Serg. W. (April 30).

McWHINNEY, Gnr. M., R.M.A., Anti-Aircraft Brigade.

PHILLIPS, 8177 2nd Class Air Mech. A. (December 17).

†SAMPSON, Serg. J. (June 6).

SIMPSON, 3515 2nd Class Air Mech. J. W.

STONE, Serg. W. L., R.M.A., Anti-Aircraft Brigade.

STUTTARD, 2nd Class Air Mech. F. A.

SUTCLIFFE, 1st Class Air Mech. T. H. (July 3).

†TUGWELL, 1934 1st Class Air Mech. S. (March 18).

UPTON, R., Master Mariner (May 12) (died of pneumonia).

PRISONERS OF WAR

GOODCHILD, Flight Serg. H.

JUDGE, Corp. V.

MISSING

COX, 2373 1st Class Air Mech. D. H., R.F.C.

KIRKBRIDE, 2036 1st Class Air Mech. H. J., R.F.C.

† Reported accidentally killed.

AIRCRAFT IN ACTION

OFFICIAL INFORMATION

ENGLAND

December 29—Unsuccessful Enemy Attack on Aerodrome—Yesterday (December 28) the enemy made an unsuccessful attack on one of our aerodromes. Of four machines only two reached their objective. No damage was done. One of our aeroplanes was shot down.

December 30—Raid on Hervilly Aerodrome and Comines Station—From Headquarters: "Yesterday (December 29) 16 of our aeroplanes bombed Comines Station. The station, railway lines and shed in the vicinity were hit. Ten of our aeroplanes attacked Hervilly Aerodrome and did considerable damage. In the above cases all the machines returned safely."

[Comines is on the Lys, about nine miles north-east of Armentières; Hervilly lies east of Amiens between the Somme and the St. Quentin Canal.]

"During the day there were 12 encounters with hostile aeroplanes. One of our machines engaged four of the enemy's, one of which is believed to have been brought down and another damaged, all four being driven off. One of our aeroplanes was brought down as a result of a combat with two hostile machines."

FRANCE

December 29—Aerial Reconnaissance—On the heights of the Meuse our artillery, firing against a German battery marked down in the Bois-de-Warmont, north-east of Saint Mihiel, was, according to the reports of aviators, very successful.

December 30—Aeroplane Directs Artillery—To the north of Soissons our artillery fire, directed by aeroplane, reduced to silence and damaged a German battery.

December 31—Enemy Seaplane Destroyed by Italian Cruiser—French Official. During the bombardment of Durazzo on the 29th the enemy used hydroplanes. One of these machines was destroyed by an Italian cruiser.

DARDANELLES

December 28—Bombs near Galatkoj—On December 25 enemy aviators unsuccessfully dropped bombs in the neighbourhood of Galatkoj.

December 29—Enemy Aeroplane Falls into Sea—Turkish official: "On the Dardanelles front one of three enemy aeroplanes flying over Ari Burnu was hit by our artillery fire and fell into the sea. It was subsequently towed by two vessels to Imbros. One of our seaplanes successfully dropped four bombs on the enemy's camp."

December 30—Enemy Biplane Brought Down—Turkish official: "In the forenoon (December 27) our artillery brought down a biplane which was flying over Yeni Shehr and Kum Kale (at the entrance of the Straits, on the Asiatic coast). It fell into the sea near Tekke Burnu and was towed in the direction of Imbros."

December 30—Bombs on Mudros War Stores—Turkish official: "On December 27 one of our seaplanes undertook reconnoitring trips, flying over Lemnos and Mavro (between Tenedos and the entrance of the Straits), and successfully dropped bombs on the harbours and war stores at Mudros, which were set on fire."

December 30—Enemy Aeroplane Driven Off—French official: "In the afternoon (December 28) an enemy aeroplane which attempted to fly over our lines was driven off by Allied machines."

December 31—Bombs on Sedd-el-Bahr—Turkish Official. On Wednesday (December 29) one of our seaplanes dropped bombs on the enemy camp at Sedd-el-Bahr, causing an outbreak of fire.

ITALY

December 30—Austrian Aeroplane Brought Down—An enemy aeroplane was also shot down by one of our destroyers.

BALKANS

December 27—Austrian Attack on Podgoritz—Montenegrin official: "An Austrian aeroplane on the 27th inst. threw several bombs on Podgoritz, killing two Austrian prisoners."

December 29—French Aviators' Work in Macedonia—An official Note on the work of the French aviators who landed at Salonika on October 19 is issued, and states that they encountered great difficulties in installing an aviation park, as the mobilised Greek Army had taken over all suitable places. Nevertheless, the First Squadron was ready in less than a week and effected the first reconnaissance on October 31 in the Ghevgeli region. Flying is especially difficult in Macedonia, as landing places are non-existent, the ground is very hilly, and it is very cold. Despite this, the aviators during November made 54 flights and obtained valuable information. They bombarded important camps, especially at Uskub, Ishtip, and Struminitza, where they caused an absolute panic. Their exploits created great admiration among the Greek people and Army.

December 30—Bulgarian Encampments Bombarded—French official: "During the day of the 29th our aeroplanes bombarded the Bulgarian parks and encampments at Petrik, to the east of Lake Doiran."

December 31—Attack on Salonika—French Official. Some aviatiks dropped bombs on Salonika on the 30th. One of these bombs fell on a Greek detachment which was carrying out manoeuvres in the presence of Prince Andrew. A shepherd was killed 50 yards away. The material losses were insignificant.

GERMANY

December 29—Three English Aeroplanes Brought Down—The English lost two aeroplanes yesterday (December 28), one of which was forced to descend to the north of Lens by the fire of our anti-aircraft guns. The other one, a large battle aeroplane, was shot down in an aerial battle to the north of Han. On December 27 a third English aeroplane was destroyed by fire to the west of Lille.

December 30—Attack on Wervicq and Menin—English Machine Shot Down—The aviators on both sides were also very active. An enemy aerial squadron attacked Wervicq and Menin and the station buildings there. No military damage was caused, but seven persons were injured and some children were killed. An English aeroplane north-west of Cambrai was shot down in an aerial combat.

[See Report from General Headquarters]

December 31—Air Raid on Ostend—An enemy air attack on Ostend caused considerable damage to buildings in the town. The Convent of the Sacred Heart especially suffered. Nineteen Belgian inhabitants were injured and one killed. No military damage was done.

FROM OTHER SOURCES

FRANCE

The Body of a German Aviator Found in the Hallatte Forest—A dragoon has just discovered a body, with the head deeply embedded in the soil and dressed in the uniform of a German aviator, in the forest of Hallatte, near the village of Rumont. The body has been recognised as that of one of the German aviators who, on August 28 last, tried to fly over Paris, and whose machine was driven off by a French machine over the forest of Hallatte. A solitary corpse, half burnt, was then found under the debris of the machine. It was that of the German aviator Beiler, son of a Bavarian general. The other aviator, whose body has just been found, was thrown out of the machine during the descent, and has now been buried in the cemetery of Senlis.

December 30—Two Fatal Accidents—A serious aeroplane accident occurred on the morning of December 28 near Lunéville. Sergt. Dayène was flying at a height of 100 metres when the machine was caught in a remou, side-slipped, and crashed to earth. Sergt. Dayène was killed on the spot.

A second accident occurred in the afternoon of December 29 at the Bourget Aerodrome. An aviator recently returned from the front was testing a new machine, when it turned turtle on landing. The aviator was already dead when taken from under the machine.

ITALY

December 29—German Observation Roof and Cement Platform—Previously reported. During the court-martial on Major Zunini, mention was made of a certain Kliver, a German manufacturer. It is now reported that Kliver's so-called manufactory consisted of a cement platform and a lofty villa, whose roof commanded a full view of the Italian aviation station of Mirafiori.

BALKANS

December 28—Allies' Air Reconnaissance—The Allies' aeroplane reconnaissance of the enemy positions ascertained that unusual calm prevailed everywhere, and no indication of any projected offensive was observed.

December 30—Aeroplanes over Salonika—There was considerable excitement in Salonika this morning when three enemy aeroplanes flew over the town and harbour. They were heavily bombarded by the warships, but as they were flying high they were apparently not touched. French aeroplanes have just gone up in pursuit.

December 31—Two Interned French Aviators Escape—The two French aviators, Badon and Chatelain, interned in Switzerland, have succeeded in making their escape and in reaching French territory. They had been interned near Zurich, and gave the slip to their guard during their daily exercise. On December 27 they arrived at Ouchy on the lake of Geneva, hired a motor-boat and crossed over to Evian on the French shore.

GERMANY

December 30—Germans Hampered in the West—The Special Correspondent of the *Morning Post*, writing from Northern France with regard to German intentions in the West for the winter, states: "And there are further reasons why the German power of offence is becoming more difficult—the increased weight of our artillery, and also the activity and precision of our air fleet, by which important railway junction points behind the German front can be, and are being, damaged as occasion requires. By these means we can disorganise the enemy's preparations in a way in which he cannot hamper our movements."

PROGRESS AT THE FLYING SCHOOLS

The Grahame-White School—Report of the progress of pupils at the schools for the week ended January 1, 1916:—*Civilian School*—Straights with instructor: Butler, Grasset, Lewis, McClaughrie, Matthews, and Leigh; circuits with instructor: Hallet; circuits alone: Hughes; brevet during week: Yates. *Royal Naval Air School*—Straights with instructor: Probationary Flight Sub-Lieuts. Aitkin, Cook, Cuckney, Newton, Rampling, Rockey, and West; eights with instructor: Probationary Flight Sub-Lieut. Horniman; brevets during week: Probationary Flight Sub-Lieuts. Aird, Moody, and Ovens. Instructors during week: Manton, Pashley, Russell, and Winter.

The Hall School—Owing to the Christmas vacation and bad weather, practice was only put in by the following pupils: Arnsby, Ormerod, Cosgrave, Lieut. Cooke, Ridley, Collins.

The London and Provincial School—Instructors: W. T. Warren, M. G. Smiles, C. M. Jacques, H. Sykes, and W. T. Warren, jun. Pupils doing rolling: Snow, Egelstaff, Hardy, and Creaghan. Pupils doing straights: Hunt and Knowles. Machines in use: Four tractor biplanes.

The Ruffy-Baumann School—Pupils with instructor: Dobson, Pauli, Edgar, Winter, Huntiaux, De Launoit, Cox, Durand. Straights: Vernon, Griffith, De Launoit. The last three students are now ready for their certificates, and should pass during the next fine spell of weather. Machines: 60 and 50 h.p. Caudron type biplanes, dual control. Instructors: Edouard Baumann, Felix Ruffy, Ami Baumann, Clarence Winchester.



PUPILS AT THE MIDLAND FLYING SCHOOL,
BIRMINGHAM

OFFICIAL NOTICES

ROYAL AERO CLUB

SPECIAL COMMITTEE MEETING

A Special Meeting of the Committee was held on Tuesday, December 21, when there were present: Prof. A. K. Huntington, in the Chair, Mr. Ernest C. Bucknall, Flight Lieut. C. F. Pollock, R.N.A.S., and the Assistant Secretary.

ELECTION OF MEMBERS

The following new members were elected:—

Archibald Jack Campbell.
Flight Lieut. Ronald Portman Cannon, R.N.A.S.
Bertram Powell Chase.
Second Lieut. Dougall Cushing, R.F.C.
Flight Commander John Henry Lidderdale, R.N.A.S.
Second Lieut. John Nigel MacRae ((11th Black Watch).
Arthur Meyrick.
Robert Sutherland Rattray.
Andrew Jackson Stone.

AVIATORS' CERTIFICATES

The granting of Aviators' Certificates Nos. 2110 to 2180 was confirmed.

The following Aviators' Certificates were granted:—

- 2181 Second Lieut. Thomas Earle Gordon Scaife (6th Dragoon Guards (Carabineers)) (Maurice Farman Biplane, Military School, Farnborough). October 22, 1915.
2182 Second Lieut. Hugh George Corby (Royal Munster Fusiliers) (Maurice Farman Biplane, Military School, Farnborough). December 2, 1915.
2183 Lieut. Walter Richard Gayner (17th Reserve Infantry Bn., Canadian Division) (Caudron Biplane, Beatty School, Hendon). December 11, 1915.
2184 Maurice Martin (Belgian subject) (L. and P. Biplane, London and Provincial School, Hendon). December 20, 1915.
2185 Henry Philip Burgess (L. and P. Biplane, London and Provincial School, Hendon). December 20, 1915.

- 2186 Flight Sub-Lieut. Adam Beattie Ovens, R.N.A.S. (Grahame-White Biplane, Grahame-White School, Hendon). December 20, 1915.

- 2187 Eric Burnett Gammon (Grahame-White Biplane, Grahame-White School, Hendon). December 20, 1915.

AERONAUTS' CERTIFICATES

The granting of Aeronauts' Certificates Nos. 55 to 57 was confirmed.

HONOURS FOR THE AIR SERVICES

The *Gazette* of January 1, 1916, announced that H.M. the King had been graciously pleased to give orders for the appointment of the following officers to be Companions of the Distinguished Service Order:—

D.S.O.

Capt. Edwin Harold BARR, R.M.A.

For services with the Royal Marine Artillery Anti-Aircraft Brigade in France.

Flight Sub-Lieut. James Brian Patrick FERRAND, R.N.

On November 28, 1915, accompanied by First Class Air Mechanic Oldfield as gunner, Flight Sub-Lieut. Ferrand attacked a hostile seaplane, which was accompanied by three more seaplanes and a destroyer, off the Belgian coast, and brought it down by gunfire into the water, where it immediately sank. He then attacked the destroyer, and only abandoned the attack after coming under heavy shell fire both from the destroyer and the shore batteries of Westende.

Flight Sub-Lieut. Taunton Elliott VINEY, R.N.

For his services on November 28, 1915, when, accompanied by le Lieutenant en Second de Sincay as observer, he destroyed a German submarine off the Belgian coast by bombs dropped from an aeroplane.

To be an Honorary Companion of the Distinguished Service Order:—

Le Lieutenant en Second Colley Saint-Paul COMTE DE SINCAY, attached to No. 1 Wing, Royal Naval Air Service.

For his services in connection with the destruction of a German submarine by bombs dropped from an aeroplane on November 28, 1915.

DISTINGUISHED SERVICE CROSS

Acting Lieut. Harold Roger LAMBERT, R.M.

For services with the Royal Marine Artillery Anti-Aircraft Brigade in France.

Promotions, January 1, 1916.

ROYAL NAVAL AIR SERVICE

SQUADRON COMMANDERS TO BE WING COMMANDERS

Robert Gordon.
Robert Hamilton Clark-Hall.
Charles Russell Jekyl Randall.
Richard Bell Davies, D.S.O.

FLIGHT COMMANDERS TO BE SQUADRON COMMANDERS

Frederick William Bowhill.
Arthur Bruce Gaskell.
Ennis Tristram Ratcliffe Chambers (now Acting Squadron Commander).
Cecil Francis Kilner, D.S.O.
Edmund Digby Maxwell Robertson.
Reginald Lennox George Marix, D.S.O.
Francis Kennedy McClean (for temporary service) (now Acting Squadron Commander).
John Tulloch Cull, D.S.O. (now Acting Squadron Commander).

FLIGHT LIEUTS. TO BE FLIGHT COMMANDERS

John Marten Rush Cripps.
Thomas W. Elsdon.
Herbert Stanley-Adams (now Acting Flight Commander).
George Miller Dyott (for temporary service) (now Acting Flight Commander).
Robert Hilton Jones.
Cuthbert Morgan Murphy (now Acting Flight Commander).
Douglas Claude Strathern Evill (now Acting Flight Commander).
John Philip Wilson, D.S.C. (now Acting Flight Commander).
James Douglas Maude.
Ernest Victor Samuel Wilberforce.
John Dunville (for temporary service).
Charles Frederick Pollock (for temporary service).

FLIGHT SUB-LIEUTS. TO BE FLIGHT LIEUTS.

Charles George Verner.
Benjamin Travers.
John Conrad Peter Wood.
Arthur Charles Teesdale.
Eustace Fletcher Moyes.
Arthur Qulton Cooper (for temporary service) (Acting Flight Lieut.).
Frederick Whittington Gamwell (now Acting Flight Lieut.).
Robert Dymond Gladman Sibley.

Lawrence Pratt Openshaw.
 Cuthbert Everard Brisley (for temporary service).
 William Geoffrey Moore.
 George Hancock Reid.
 Thomas Vaughan Lister.
 Thomas Francis Netterville Gerrard.
 Oswald Noel Walmesley.
 James Edward Baker Maclean.
 John Daniel Newberry.
 Thomas Ilinshelwood.
 Frank Thomas Digby.
 Bertram Denison Kilner.
 Ralph Squire Sorley.
 John Thearsby Bankes-Price (for temporary service).
 Frank Besson.
 Charles William Fairfax Morgan.
 Robert Hudson Routledge.
 Christopher Eric Wood.
 Eustace de Courcy Hallifax.
 Colin Johnson.
 Dudley Ware Alexander Barton.
 James Brian Patrick Ferrand.
 John Stanley Fleming Morrison.
 Richard Cecil Hardstaff.
 Frederick William Lucas.
 Leslie Hewitt Hardstaff.
 Royce Gustave André Baudry.
 Arthur Frederick Foy Jacob.
 Guy William Cranfield (for temporary service).
 William Charles Michie (for temporary service).
 Gilbert Formby Smylie.
 Frank Fowler.
 Charles Walter Graham (for temporary service).
 Alexander Robb Cox.
 Colin Temple MacLaren.
 Cecil Douglas Morrison.
 John Robert Davison (for temporary service).
 Edward Stewart Cripps (for temporary service).
 Arthur Hamilton Chandler (for temporary service).
 Taunton Elliott Viney.
 Ernest Arthur Oliphant Auldjo-Jamieson.

CASUALTIES

KILLED

December 17
 Phillips. 8177, Second Class Air Mechanic A.

ROYAL NAVAL AIR SERVICE

December 29

SLIGHTLY INJURED

Flight Sub-Lieut. Cyril R. Terraneau, R.N.
 With reference to the announcement of December 31, the name of the officer slightly injured should read Flight Sub-Lieut. Cical R. Terraneau, R.N.

ROYAL FLYING CORPS

WOUNDED

Undated

Second Lieut. L. Moss, A.S.C., and Royal Flying Corps.

AEROPLANE ACCIDENT AT GOSPORT

Lieut. W. F. Rogers, of the Royal Flying Corps, was killed in an aeroplane accident at Gosport on December 29. His machine was flying low when it suddenly fell to the ground. Lieut. Rogers was unconscious when picked up, and died immediately afterwards.

A coroner's inquiry was held at Haslar Hospital on December 30 into the death of the above-mentioned officer. Expert evidence showed that while he was a skilled aviator in certain types of machines, he was not familiar with the controls of the machine in which he was then flying, and, contrary to warning, endeavoured to turn before ascending to a sufficient height. A verdict of accidental death was returned.

Lieut. Rogers was buried with full military honours on Saturday, January 1, at Reading.

APPOINTMENTS

ROYAL NAVAL AIR SERVICE

M. C. Wood and H. C. Nash, both entered as Temporary Probationary Flight Sub-Lieuts., with seniority of December 6, and appointed to *President*, additional, for R.N.A.S.

R. K. J. Vallings, granted a temporary commission as Sub-Lieut. (R.N.V.R.), with seniority of December 27, and appointed to *President*, additional, for R.N.A.S., for (E.) duties.

Leading Mechanician:

R. J. G. Crouch, granted a temporary commission as Sub-Lieut. (R.N.V.R.), with seniority of December 25, and appointed to *President*, additional, for R.N.A.S.

Temporary Sub-Lieut. (R.N.V.R.):

E. Ball, entered as Probationary Flight Sub-Lieut., for temporary service, with seniority of December 28, and appointed to *President*, additional, for R.N.A.S.

Chief Petty Officer (R.N.):

S. H. V. Fill, granted a temporary commission as Lieut. (R.N.V.R.), with seniority of December 26, and appointed to *President*, additional, for R.N.A.S.

The following have been granted temporary commissions as Sub-Lieut. (R.N.V.R.), and all appointed to "President," additional, for R.N.A.S., with seniority as follows:

F. W. Mardock: December 27.

D. R. W. Thompson and A. M. Tidey: December 30.

Temporary Warrant Officer (Second Grade):

J. W. Alcock, promoted to Flight Sub-Lieut. for temporary service, with seniority of December 29.

G. S. Gray and M. G. Dover, both entered as Flight Sub-Lieuts. on probation, for temporary service, with seniority of December 6.

Temporary Warrant Officer (Second Grade) J. W. Alcock has been promoted to the rank of Flight Sub-Lieut. for temporary service: December 30.

ATTACHED TO HEADQUARTER UNITS

Brigade Commander:

Brevet Lieut.-Col. William S. Brancker, R.A., and to be temporary Brig.-Gen. whilst so employed: December 18, 1915.

REGULAR FORCES

STAFF

Deputy Director at War Office:

Brevet Lieut.-Col. D. S. MacInnes, D.S.O., R.E., from an Assistant Director, and to be temporary Col. whilst so employed, vice Brevet Lieut.-Col. W. S. Brancker, R.A.: October 31.

Assistant Directors:

Major (temporary Lieut.-Col.) J. D. B. Fulton, C.B., R.A. (since deceased), from Chief Inspector, Aeronautical Inspection Dept., and retain temporary rank whilst so employed, vice Temporary Col. D. S. MacInnes, D.S.O.: October 31. Brevet Major (temporary Lieut.-Col.) W. D. Beatty, R.E., from Chief Inspector, Aeronautical Inspection Dept., and retain temporary rank whilst so employed, vice Major (temporary Lieut.-Col.) J. D. B. Fulton, C.B. (since deceased): November 13.

Deputy Assistant Director:

Capt. E. R. L. Corballis, Royal Dublin Fusiliers, a Flight Commander, R.F.C., vice Capt. G. M. Griffith, R.A.: October 31.

Aeronautical Inspection Department:

Chief Inspectors—Brevet Major W. D. Beatty, R.E., from D.A.Q.M.G., and to be temporary Lieut.-Col. whilst so employed, vice Major (temporary Lieut.-Col.) J. D. B. Fulton, C.B. (since deceased): October 31. Capt. R. K. Bagnall-Wild, R. of O., from Inspector of Engines, and to be temporary Lieut.-Col. whilst so employed, vice Brevet Major (temporary Lieut.-Col.) W. D. Beatty: November 13.

ROYAL FLYING CORPS

Wing Commanders, from Squadron Commanders, and to be temporary Lieut.-Cols. whilst so employed:

Capt. (temp. Maj.) G. S. Shephard, Royal Fusiliers (City of London Regt.): December 10.

Capt. (temp. Maj.) G. W. P. Dawes, Royal Berkshire Regt.: December 12.

Squadron Commanders, from Flight Commanders, and to be temporary Majors whilst so employed:

Capt. R. B. Martyn, Wiltshire Regt.; Capt. H. Le M. Brock, Royal Warwickshire Regt.; Lieut. (temp. Capt.) L. A. Strange, Dorsetshire Regt.: December 7.

Capt. J. G. Hearson, R.E.: December 17.

Flight Commanders, from Flying Officers.

Capt. H. Petre, Commonwealth Military Forces: November 22.
 Capt. (temp. Lieut. in Army) E. W. Powell, Unattached List, T.F.: December 8.

Flight Commanders, from Flying Officers, and to be temporary Capt. whilst so employed:

Temp. Second Lieut. H. B. R. Grey-Edwards, R.A.: November 22.

Temp. Second Lieut. B. P. Greenwood, General List: November 28.

Lieut. R. H. S. Mealing, S.R.; Temp. Second Lieut. E. E. Clarke, A.S.C.: December 3.

Second Lieut. R. E. A. W. Hughes-Chamberlain, S.R.: December 6.
 Second Lieut. W. D. S. Sanday, S.R.: Lieut. L. W. Learmount, S.R.: December 8.
 Lieut. R. Balcombe-Brown, R.F.A., S.R.: December 12.
 Lieut. G. L. P. Henderson, S.R.: December 15.

Equipment Officers, and to be temporary Capts. whilst so employed:

Second Lieut. (temporary Lieut.) C. E. Prince, Westmorland and Cumberland Yeomanry, T.F.: November 29, 1915.
 Lieut. H. A. Oxenham, Special Reserve, from an Assistant Equipment Officer: November 30, 1915.

Flying Officers:

Capt. J. U. Kelly, Duke of Edinburgh's (Wiltshire Regt.), and to remain seconded, and Temporary Lieut. G. Klingsenstein, A.S.C., and to be transferred to the General List: December 1, 1915.

Temporary Lieut. N. C. Sampson, attached 2nd Dragoon Guards (Queen's Bays), and to be transferred to the General List; Second Lieut. C. M. B. Chapman, Buffs (East Kent Regt.), and to be seconded; Second Lieut. G. W. Roberts, R.F.A., Special Reserve: December 2, 1915.

Capt. C. T. Maclean, Royal Fusiliers (City of London Regt.), Special Reserve, and to be seconded; Lieut. (temporary Capt.) G. V. Rice, R.F.A., T.F.; Lieut. C. H. Gardner, R.F.A., T.F.; Lieut. D. Grinnell-Milne, Royal Fusiliers (City of London Regt.), Special Reserve, and to be seconded; Temporary Second Lieut. C. H. Tancred, R.A., and to be transferred to the General List; Second Lieut. L. H. T. Sloan, Queen's Own Cameron Highlanders, and to be seconded; Temporary Second Lieut. B. E. Baker, Rifle Brigade (Prince Consort's Own), and to be transferred to the General List; Temporary Second Lieut. L. J. Pearson, R.E.; Second Lieut. J. W. Toone, Royal Irish Regt., and to be seconded; Second Lieut. F. E. Goodrich, Special Reserve: December 7, 1915.

Temp. Second Lieut. A. H. W. Tollemache, R.E., and to be transferred to the General List; Temp. Second Lieut. T. A. Oliver, Royal Welsh Fusiliers, and to be transferred to the General List: December 10.

Temp. Second Lieut. R. H. Anderson, Rifle Brigade, and to be transferred to the General List; Lieut. A. R. S. Clarke, Dorset Regt., and to be seconded; Temp. Second Lieut. F. H. Furness-Williams, R.A., and to be transferred to the General List; Temp. Second Lieut. H. S. Powell, General List: December 14.

Second Lieut. H. A. B. Robb, S.R.: December 15.

Balloon Officers:

Lieut. C. H. Stringer, 5th (Royal Irish) Lancers, and to be seconded; Second Lieut. (temporary Lieut.) H. B. Martindale, East Surrey Regt., T.F.: December 2, 1915.

Second Lieut. J. W. Jardine, Special Reserve: December 4, 1915.

Temporary Capt. W. Lambert, Royal Fusiliers (City of London Regt.), and to be transferred to the General List; Temporary Lieut. W. B. Hellard, General List: December 8, 1915.

Assistant Equipment Officers:

Second Lieut. R. A. Courtney, Special Reserve: October 25, 1915.

Temporary Capt. E. B. Palmer, A.S.C.; Lieut. H. R. Raikes, Buffs (East Kent Regt.), Special Reserve: November 17, 1915.

Second Lieut. H. J. C. Smith, Special Reserve: November 26, 1915.

Second Lieut. N. S. Percival, Special Reserve: November 28, 1915.

Second Lieut. A. W. Cott, Special Reserve; Second Lieut. M. A. Shepstone, Special Reserve; Second Lieut. R. S. Witchell, General List; Second Lieut. W. J. Hewitt, Special Reserve; Second Lieut. T. L. F. Burnett, Special Reserve; Second Lieut. E. W. Havers, Special Reserve; Second Lieut. H. L. Conner, Special Reserve; Second Lieut. C. G. Smith, Special Reserve; Second Lieut. F. H. Songhurst, Special Reserve; Second Lieut. W. T. W. Wartnaby, Special Reserve; Second Lieut. G. McKerrow, Special Reserve: November 29, 1915.

ROYAL FLYING CORPS—SPECIAL RESERVE

Second Lieut. (on probation) confirmed in his rank:
 H. A. B. Robb.

To be Second Lieuts. (on probation):

L. Minôt: October 28.
 A. T. Watson, J. V. Nash: November 17.
 L. Porter: November 22.
 J. T. Spittle: November 23.
 W. G. Stewart, L. F. Hutcheon: November 25.
 W. A. Spratt: November 26.
 C. L. H. Hicks: December 2.
 D. W. S. Paterson: December 8.
 W. J. M. Tomson: December 28.

The undermentioned temporary appointment is made:—
Major-General in Charge of Administration:

Maj.-Gen. Richard M. Ruck, C.B., Reserve of Officers, from a Chief Engineer, vice Maj.-Gen. J. Adye, C.B.: dated November 9, 1915. (Maj.-Gen. R. M. Ruck is Chairman of Council of the Aeronautical Society.)

THE INSTITUTION OF AUTOMOBILE ENGINEERS

The next General Meeting of the Institution of Automobile Engineers will be held on Wednesday, January 12, 1916, in the Hall of the Royal Society of Arts, John Street, Adelphi, W.C., at 8.0 p.m., when Mr. Geo. W. Watson will read a paper entitled "Back Axles."

Cards of invitation to the meeting may be obtained on application to the Secretary of the Institution of Automobile Engineers, 28, Victoria Street, S.W.

PETROL PRICES

Following are current retail prices for the following brands of motor spirit:—"Shell," 2s. 2d. per gallon; "Shell II.," 2s. 1d.; and "Crown," 2s. These prices rule practically all over England and Wales. In Ireland and Scotland the prices vary according to the district.

THE BLERIOT MANUFACTURING AIRCRAFT CO., LTD.

At Bow Street Police Court, on December 29, before Mr. Hopkins, Harry John Lawson, John Henry Swinburn, and C. W. Langford were summoned for failing to file with the Registrar of Companies a return of the allotment of shares made by the Blériot Manufacturing Aircraft Co., Ltd.

Mr. G. W. H. Jones, who appeared in support of the summonses, stated that the defendants were directors of the company, and the proceedings were taken at the instance of Mr. Cassells, a shareholder. The company was promoted by the Army and Navy Contract Corporation, Ltd., the whole of the shares in which were in the name of Lawson. The Blériot Company was incorporated on May 19, and, although it was formed for the purpose of going to the public, it was first registered as a private company, counsel's submission being that the object of this was to deprive the shareholders in the public company of those safeguards to which they were entitled. Three days after the incorporation there was a meeting of seven solicitors' clerks, who were the signatories, and the company was converted into a public company. On June 14 a resolution was passed to increase the capital to £200,000—190,000 ordinary £1 shares, carrying 10 per cent., and 200,000 deferred shares of 1s. each. There were offered to the public 95,000 ordinary shares and 100,000 deferred 1s. shares. The original directors of the Blériot Company were the Duke of Manchester, Admiral the Hon. Sir E. R. Fremantle, Sir Algernon Guinness, Bart., Mr. W. A. Casson, and Mr. Swinburn.

"As to the Duke of Manchester," said Mr. Jones, "I don't know, but Admiral Fremantle and Sir Algernon Guinness were quite independent of the promoters." Continuing, he said the objects of the company were to acquire and extend the well-known business of M. Blériot, and supply aeroplanes to the order of the Government. The company acquired M. Blériot's rights for £100,000, payable £30,000 in cash, £43,000 in £1 shares, and the balance in cash or shares at the option of the promoters. It was provided that the promotion syndicate should nominate two directors. The whole of the money was subscribed by the public, with the exception of 100,000 of the deferred 1s. shares—a total of something like £95,000. Certain payments were made by the company to the promotion syndicate, after which M. Blériot refused to complete his contract, and the corporation started an action against him for specific performance. Mr. Jones added that Admiral Fremantle and Sir Algernon Guinness resigned, and from that time onwards the defendants had been pressed to make a return of the allotments in order that a meeting of shareholders might be called, but they had not done so.

Admiral Fremantle gave evidence that he resigned his directorship on July 23, and he believed the allotments were then complete. He afterwards wrote a letter to the Secretary, asking that the shareholders should be called together and their money returned.

Mr. H. H. Curtis Bennett, counsel for the defence, submitted that although technically there might have been an offence, the prosecution was not a bona-fide one, but was the outcome of a private quarrel between the directors of this company. The reason the return had not been made was because of the difficulty of getting work of this kind properly done at the present time.

Mr. Hopkins said he would take into account the fact that no proceedings had been taken by the Board of Trade, who were the prosecuting body. He fined each of the defendants £10, and also ordered the payment of £15 15s. costs.

COMPANY NEWS

AIRCRAFT ACCESSORIES CO., LTD.—Meeting at 49, Queen Victoria Street, E.C., January 31, 1916, to receive liquidator's report.

MAYRO-WING AVIATION CO. (James Mayrow, trading as), 82a, Lillie Road, Fulham, S.W.—Receiving Order, December 22, 1915.

AERONAUTICS

A WEEKLY JOURNAL DEVOTED TO THE TECHNIQUE OF AERONAUTICS

(FOUNDED 1907)

Edited by JOHN H. LEDEBOER, B.A., A.F.Ae.S.

VOL. X. No. 117 (NEW SERIES)

JANUARY 12, 1916

[Registered at the G.P.O.]
as a Newspaper

ONE PENNY

THE BALANCE SHEET

IT is always easy, and a favourite pastime with many, to be wise after the event. The rôle of the prophet is a more hazardous and uncertain one—if, that is, he belongs to the rare and almost extinct variety of honest prophets. The modern journalist adopts the simpler expedient of calmly ignoring the false prophecies he has made in the past, and, trusting to the simple credulity of his readers, exclaims with sublime effrontery, "I told you so," or "As I predicted months ago —." Since the very first year of this memorable century the German Government, through the medium of Count Zeppelin, has spared no efforts—save those latterly imposed upon it by the limitations of output—monetary or otherwise, to build up a gigantic fleet of monster airships, unparalleled for power, speed and carrying capacity, and so heavily armed as to be well-nigh invulnerable to aerial attack. On only two occasions has a large airship been materially damaged by aeroplane attack, and one of those, as most of us know by now, was in the nature of a fluke.

And here let me confess at once that before the outbreak of war, as records testify, I viewed the German airship menace with grave disquietude. In common with Commandant van den Plas, a well-known Belgian authority, I held the opinion that England, and London in particular, owing to our aerial supineness, was laying up for herself a night of terror. Here was this mighty German fleet building, developing, ever growing in size and in destructive power; here was rapidly springing up that vast organisation of aerial harbours and the wonderful system of wireless stations which soon covered the German Empire with a closely interwoven network. Meanwhile, we remained smugly content to do precisely nothing to counter the growing danger.

The Hun is a methodical beast, and one who has always expected to receive full value for his money. Surely it was not for nothing that, after already sinking five millions or more—say the cost of three men-of-war—in forming his airship establishment three years ago, he suddenly sprang upon an astonished world his vast future airship-building programme. Yet now, in my capacity as a prophet in this matter, I confess myself disgruntled. For the Zeppelins have come, and sometimes they have gone, but England, and London in particular, still stands where she did. We, possibly inhabiting a district which has had the honour of several visitations, are apt to form an exaggerated notion of the destructive effect of

these local raids, whereas, viewed from a proper perspective—say from an aeroplane navigating over the vast expanse of London—it would be barely discernible, and probably not at all. In spite of the gradual perfection of our air defences and our recent comparative immunity from aerial attack—which, by the way, has been due to unfavourable meteorological conditions fully as much as to losses in the German airship fleet and *matériel* and *personnel*—it must not be supposed that Zeppelin raids will not be repeated in the future, probably on an even larger scale and with additional ferocity and ruthlessness. Apart from general considerations and such information as leaks through from time to time regarding German constructional activity at Friedrichshafen (where over 3,000 workmen are now employed), elsewhere we have recently received more than one hint, given with characteristic German tactlessness and ingenuousness, that the Zeppelin fleet is about to enter upon a new campaign. To mention only a single instance: quite recently there have appeared in several German papers so-called maps of the inner and outer defences of London, giving the alleged emplacements of anti-aircraft guns and searchlight stations and the situation of a whole ring of strong fortifications surrounding the metropolitan area. Now there can be only one explanation of these childish manœuvres, and that is an attempt beforehand to justify the Germans in the eyes of the neutral world in attacking an open town. We all remember how the German official attempted beforehand to discount his use of poison gas during the second battle of Ypres by accusing our troops of having previously resorted to this dastardly expedient. The worst of it is—from his point of view—that the Hun always reveals his possession of a cloven hoof in his attempt to conceal it.

Let us therefore attempt to strike a balance-sheet, reduce the whole matter to one of pure economics, build up a profit and loss account, dear to the heart of every Hun. Elsewhere in this issue is published a list of the losses of the German airship fleet since the outbreak of hostilities and another list of its raids on England, both compiled as far as possible from official sources or from reliable reports which investigation and internal evidence have shown to be worthy of credence. From these lists it appears, on the one hand, that in eighteen months of war the Germans and the Austrians (who may be lumped together for this purpose) have lost a minimum of sixteen Zeppelins, chiefly of the most recent class

originally destined for naval work, and at least eight dirigibles of other and weaker types. It should be repeated once again that, in contrast with many previous estimates published—most of them based on the wildest and obviously imaginative rumours—these compilations have been made with the greatest care; all elements of uncertainty have wherever possible been eliminated, and the principle has been consistently followed of underestimating rather than over-stating our own case.

Since last August twelvemonth, then, the Germans have lost sixteen rigid dirigibles of capital size, among them at least seven naval craft, including *L3*, *L4*, *L7*, *L8*, *L9*, *L18* and *L22*. Since several of the remaining

lie open and defenceless to this new mode of attack and destruction. Let us remember this view of the matter in the face of the renewed threats emanating from Germany regarding future raids; let us preserve our souls in patience and our hopes undaunted. For the Hun when he started out had two weapons up his sleeve wherewith in his mind he thought to subdue us: the submarine and the airship. How signally he has hitherto failed to make a military impression by either means, or with their aid to deflect the inexorable trend of events by one degree, we know by now. Meanwhile we are not idle; dim forms are slowly shaping; but of them we may not speak for the moment, though the future may have much to show.

J. H. L.



150-H.P. BURGESS PUSHER BIPLANE

vessels bore factory numbers, and in the absence of reports of later activities, one is justified in assuming that some at any rate of the other airships lost were also destined for naval use. Moreover, our list, in default of reliable information from German sources (which are naturally reticent) perforce cannot take into account losses of airships which may be classed as "peace-losses," due to the ordinary mischances which befall a dirigible during its career. Known accidents have already accounted for a loss, among the crews, of well over 150 lives; at least another 150 members of the airship personnel have been made prisoners, and thus placed out of action during the period of the war. If material losses to the German airship fleet, therefore, amount to well over £2,000,000, which is a most conservative estimate—not to mention damage to permanent buildings and air stations—its gradual weakening in trained men is an even more serious item in this aerial war of attrition.

The other side of the balance-sheet is also given elsewhere in this issue: it amounts to a total of just over 150 victims—by far the greater proportion of which were women, children and civilians, whereas every one of the German casualties represents the loss of a trained fighting man—and of just over 300 injured. And this throughout the whole expanse of thickly populated country which was supposed to

LUKE XV., 10

During the trying ordeal of the last eighteen months—as the historian will show when his due time arrives—democracy has come into its own, however much the appearances of the moment may seem to belie the fact. In truth, the war has merely hastened an inevitable stage in the development of nations, a stage whose advent we recognised last year when, in order to bring the vital importance of aviation more closely home to the great general public and to place within the reach of every member of the new growing industry of aviation the latest developments of the science, we reduced the price of *AERONAUTICS* to one penny, and this in spite of the ever-growing costs of production. Hence we note with gratification that our example has been followed by our esteemed contemporary *Flight*, which has with the New Year reduced its price to the same humble level as our own. For many years *Flight* and its editor, Stanley Spooner, have worthily upheld the traditions of English journalism and faithfully served the common cause of the British aviation industry, being, in fact—with the exception of ourselves, and we can look down complacently from the height of over a year's seniority—one of the earliest periodicals exclusively devoted to the interests of aeronautics. To our contemporary, therefore, we extend our best wishes for the success of its new enterprise.

GERMAN AIRSHIP LOSSES, 1914-1915

[NOTE—In the following table are included only the losses which the German airship fleet has suffered which have either been announced officially or subsequently confirmed from other trustworthy sources. In all probability the list is incomplete, since the evidence is more often than not conflicting.—ED.]

August 18, 1914.—Attack by French on airship shed at Metz. A Zeppelin damaged.

August 22, 1914.—Z 8 brought down by French artillery near Badonviller. Crew killed.

August 29, 1914.—Z 5 forced to land by Russian gunfire near Mlava. Crew captured.

September 6, 1914.—A military airship (type not specified) captured while at anchor, together with its crew, by the Russians near Seradj.

September 10, 1914.—Two Austrian airships (one a Parseval, the other a larger craft) captured, together with their crews, by the Russians near Peroden.

September 28, 1914.—Parseval brought down by Russian fire at Modlin, near Warsaw. Crew captured.

October 9, 1914.—British attack on Düsseldorf shed. Zeppelin burnt.

November 21, 1914.—British attack on Friedrichshafen. L Z 31 destroyed.

December 24, 1914.—British attack on Brussels shed. Parseval burnt.

January 23, 1915.—L 7 lost in the North Sea.

January 26, 1915.—Parseval P 5 brought down into the sea by Russian fire off Libau. Crew captured.

February 17, 1915.—L 3 and L 4 wrecked off Danish coast.

March 5, 1915.—L 8 damaged by Allied aeroplanes, and

finally wrecked near Tirlemont, in Belgium, while landing. L 9 disappeared in the North Sea.

April 11, 1915.—A Zeppelin wrecked near Thielt, in Belgium, while landing.

May 18, 1915.—A Zeppelin brought down by French fire near Boulogne. Crew captured.

June 7, 1915.—L Z 37 destroyed by Sub-Lieut. Warneford. L Z 38 destroyed in its shed at Evere by Sub-Lieut. Mills.

August 10, 1915.—A Zeppelin, damaged by English guns, fell into the sea off Ostend, and was finally destroyed by bombs.

August 24, 1915.—Airship (probably of the "M" class) brought down by Russian fire near Vilna. Crew captured.

September 8, 1915.—A Zeppelin badly damaged at Brussels.

October 13, 1915.—Zeppelin destroyed through an explosion near Namur (not confirmed).

November 17, 1915.—L 18 destroyed at Tondern, in Schleswig.

November 15, 1915.—Parseval brought down by Russian fire near Grodno. Crew captured.

December 1, 1915.—L 22 burnt at Husum, in Schleswig.

December 15, 1915.—Zeppelin destroyed by explosion near Namur (not confirmed).

The above list, therefore, gives a total of at least sixteen Zeppelins, mostly of the latest naval classes, and eight airships of other types known to have been lost during the eighteen months of war (not including unconfirmed cases) with a loss of over 150 lives and an even larger number of prisoners.

FRENCH AVIATORS IN THE EAST

THE following official note relative to the work of French aviators in the Balkans was issued on December 29 :—

"The first aviators, who landed at Salonika on October 19, met with great difficulties in establishing an aircraft park for the various squadrons. The Greeks, being mobilised, had naturally requisitioned for their own use all the suitable places. Finally, a suitable place was found near the sea, levelled and provided with a light railway, while hangars were erected. The first squadron was ready in less than a week, and effected the first reconnaissance on October 31 in the Gevgheli region. In due succession the other squadrons arrived, and the officer commanding in the East now had the necessary strength at his disposal. Flying is especially difficult in Macedonia, landing places are nearly non-existent, the country is very hilly, and the pilots have constantly to fly over ridges 5,000 to 6,000 feet high, very steep and impossible to land on. While crossing these ridges they form an easy target for the Bulgar patrols and irregulars. They are also obliged to fly over hidden valleys, above which very sudden and violent *remous* are encountered. Above all, the cold is intense, and frequently reaches 20 degrees. The absence of roads greatly hinders the supply of spares and provisions. Nevertheless, our aviators have carried out their reconnaissances to 120 kilometres within the Bulgar lines. During the month of November alone they made no less than fifty-four flights. They collected valuable information and took numerous photographs, which have been of the greatest value in the strategic retirement General Sarrail has just accomplished. Either alone or in squadrons they have bombarded important camps and cantonments, especially at Uskub, Istip, Kara-Hodzali, Strumnitza, and Petric. These bombardments were very effective, notably that of November 24 on Strumnitza, where the English Staff and Bulgarian prisoners state they caused an absolute panic. Equally successful was the attack on the enemy camps in the Strumnitza valley carried out by our machines equipped with quick-firers. While taking countless photographic records of the greatest military importance, our aviators made a precise and detailed survey and map of the

region, for there only existed a bad Austrian map of small scale. Thanks to their wireless apparatus, the observers have been equally useful in directing artillery. A very complete and well-organised meteorological service has been organised to assist the aviators. In this mountainous and difficult region this information is especially valuable. For instance, every day three bulletins are issued giving the speed of the wind and the height of the clouds up to 10,000 feet. Finally, the exploits of the French aviators have created great admiration among the Greek people and army.

ZEPPELIN RAIDS

Date	District	Casualties	
		Killed	Injured
Jan. 19 ..	Yarmouth and King's Lynn ..	4	9
April 14 ..	Blyth and Tyneside	—	2
April 16 ..	Lowestoft, Ipswich, and Bury St. Edmunds	—	—
May 10 ..	Southend	1	—
May 17 ..	Ramsgate	2	8
May 27 ..	Southend	3	—
May 31 ..	Outlying districts of London ..	6	—
June 4 ..	East and South-East Coasts ..	—	—
June 6 ..	East Coast	24	40
June 15 ..	North-East Coast	15	15
Aug. 9 ..	East Coast	13	12
Aug. 12 ..	East Coast	6	23
Aug. 17 ..	Eastern Counties	10	36
Sept. 7 ..	Eastern Counties and London District	17	39
Sept. 8 ..	Eastern Counties and London District	20	86
Sept. 11 ..	East Coast	None	None
Sept. 12 ..	East Coast	None	None
Sept. 13 ..	East Coast	None	None
Oct. 13 ..	Eastern Counties and London Area	56	114
		177	384

RANDOM REMARKS

XXXII.—OUR IDEALS By ARTHUR LAWRENCE

IT was a clear, frosty day. Before me was a wide expanse of crisp, bristling grass and a multitude which no man could number. Significant among them were men wearing padded coats and a badge, besides a few other things. Not one of them was less than six feet in height, and several were so close upon seven feet that I felt quite dwarfed in comparison. They were all eagle-eyed men, with glances like lightning, and yet, notwithstanding their stature and strength, there was a touch of angelic condescension which is so far removed from mere patronage that the genial warmth of it thaws the heart. Now and again a brace of these athletic giants, these sons of God whom I guessed would never speak to the daughters of men, would run into a shed and emerge with an aeroplane. Amidst the reverential communings of the vast crowd they would leap to their seats and, in less than a minute, were lost in the heavens. Gods of the Empyrean!

The preceding paragraph is more or less on the lines of an article which I had thought of writing entitled "Hendon in Winter." I had intended coming out strong upon the effect of the sun shining upon the hoar-frosted planes, and in course of time might have worked the thing up to a bit of good old-fashioned descriptive. In the pride of my heart I showed the "lead-off" of the thing to my Editor. We were in the street at the time. He said not a word, but steered me into one of those Jewish catacombs where Christians are immolated upon altars of poached-eggs-on-toast. It was not until he had disposed of his fourth cup of coffee that he was able to speak. I regretted the fact when he did. In brief, he referred to me in a way which made me call upon myself for one or two tricks in ju-jitsu, to which he promptly responded in kind. It was all done very quietly, but our efforts did not entirely escape the large, brilliant eyes of a waitress whose ancestors must have had their home in the Orient. In fact, she suggested we should finish the business outside and come back to our tea when we felt better.

In the days of my youth I became surfeited with the contrasts made between the ideal and the real. Such surprises simply assisted me farther along the grisly road of mere melancholia, and I decided not to have any more of it. If I had any ideals they would have to stand. If I state that all aviators are athletes of more than six feet in height, it is so; and all the supposed evidence to the contrary is merely moonshine. If I nominate a man as being one of the best chaps in the world, and he commits two or three crimes and some low, dirty tricks, I shall shake him more warmly by the hand than before, knowing that he has done these things in order to provide a dark background which shall show up his bright, shining ego.

On one occasion I took a lad to see "Peter Pan." In the scene of the ship when the water was washed over the bulwarks he informed me that the stage hands were casting up sand. I had no words of thanks. I could smell the wind-blown salt of those waves, and have no patience with those folk, young or old, who poke and pry behind scenes, and who know a lot more

than they're meant to. All the folk I have met have been of the first-class, tip-top description. If there are people dodging around looking for feet of clay, let 'em find 'em and then commit suicide as soon as they like. Such folk are a nuisance. I would sooner walk down Pall Mall with a cheery jail-bird on either arm. The most unfortunate young girl I ever met wound up her narrative with the remark, "And yet, you see, I have a lot to be thankful for!" Her ejaculation gave me a catch in the throat, and yet, in one way, she was right. Her attitude of mind was worth more than anything else that life can afford.

There are forms of amusement during this great war of ours which have sometimes jarred on my nerves. The self-indulgence of some common women whom I have over-heard when they have been drinking outside public-houses, toasting their respective husbands with the wish "that they may never come back," is reflected by the flaunting, giggling creatures of better clothes and more opportunities. The spectacle of a man with a glass of port in front of him and a cigar stuck in his grinning mouth—*mea culpa!*—throws the mind over the seas to where our women and children have been drowned by an enemy whose ways must give Satan pause. The only time I have been unable to restrain myself from rebuke was in the case of two wenches who were giggling as if at a raree-show when some of our wounded were being carried through Charing Cross Station. I am a poor timid thing, and was surprised to find that, after I had made some remarks which make me feel quite faint to recall, which were followed by a short and painful pause, they relieved the place of their presence. Women are contrasts, indeed. There are the mothers and nurses and the angelic majority; but I have known women with less sentiment than one can attribute to a Hanover rat, or the commander of a U submarine.

All this and much else notwithstanding, gloom is no sort of asset to anyone. At a time when I was "running" a biggish staff and large offices I indulged in a very cursory look at the books, and I woke up to the fact that after some years of proud equilibrium Mr. Debit seemed to be getting a bit of a stranglehold on Mr. Credit. This took me rather aback, so I strolled out of the office and into the sunshine in order to get a grip on the "posish." I patrolled the first quiet spot I could find off the Strand. Two bulky flower-women with their large baskets passed me. I suppose the dark shadow of my gloom went over their souls, for one of them turned to me and invoked me with "Cheer up, Percy, for Gawd's sake!" Much abashed, I endeavoured to do so. The lesson was not lost upon me. If you are looking for honesty, beauty, and mirth at the right time and in the right place, make it so and carry on. He who takes from me my ideals leaves me poor indeed. I cannot quote the Immortal more precisely, for I have never carried a purse, and if I ever had a good name, it must have been a long time ago. But the ideals must remain, no matter what else may depart. Of course, you may occasionally come down with a thud, but even that has its charm.

REVIEW OF AMERICAN AERO EVENTS IN 1915

By E. LARUE JONES, American Editor

DURING 1915, there have been granted 41 pilots' certificates, bringing the total of holders to 353; 18 have taken hydro-aeroplane certificates, bringing the total up to 41; 2 have been added to official balloon pilots, or 55 in all; the dirigible pilots remain at 3; 20 have been granted expert aviator certificates, making the total for this class 45. There are more uncertified pilots of aeroplanes than certified, which would bring the total of civilian and military pilots up to nearly 1,000.

Casualties

Thirteen lives have been lost during the year. Of these three were passengers who were killed while the pilot escaped injury, and in one accident both pilot and passenger were killed. In memoriam:—

Lincoln Beachey.	*Philip Bulman.
Geo. L. Newberry.	J. C. Pendhayn.
*Geo. H. Hersey.	Ensign M. L. Stoltz,
J. C. Redding.	U.S.N.
*Mrs. Lulu Comstock.	L. J. Lyon.
Frank Stites.	Lieut. W. R. Taliaferro,
Cecil Peoli.	U.S.A.
*Wm. D. Ely.	

* *Passengers*

Exports

Up to the end of October, 1915, 381 aeroplanes had been exported, at a valuation of \$2,792,581 (£558,500), together with parts valued at \$839,885 (£168,000). The average valuation figures out at \$7,329 (£1,466) per machine. The parts would be figured as equivalent to 114 more aeroplanes, making the total number for the 10 months 495, or 49.5 per month, an average of 1.6 per day, including Sundays and holidays. Some of the calamity howlers have been roasting the Army and the Navy for not having the "20 or more" aeroplanes exported "daily" for our total of military machines. These fireside critics seem to have overlooked the fact that the number of aeroplanes owned by any country has nothing to do with the efficiency of the air service. Aeroplanes are bought the way potatoes are bought. The great lack is trained aviators. Before the needed number can be obtained from the Army it is necessary for Congress to remove the present restrictions as to marital condition and age and rank. Plans are being made by both the Army and the Navy to obtain a reserve of civilian flyers.

The increasing demand for high-powered weight-carrying machines of giant size has brought into the aero field larger motors. Curtiss developed his 160 h.p. eight; the Sturtevant 140 h.p. eight, the Thomas 135 h.p. eight, the Maximotor 150 h.p. eight, the Christofferson 120 h.p. six, the Roberts 200 h.p. two-cycle six-cylinder, the Aeromarine 165 h.p. twelve, the Burgess-White 160 h.p. 16-cylinder, the Hall-Scott 125 h.p. eight, the Rausenberger 150 twelve, were all brought forward during the year to meet the new idea. The Aeromarine and the Burgess, as well as the Deussenberg 750 h.p., the Fredrickson 180 h.p., the Johnson 150 h.p., the Sterling 130 h.p., the Wright 120 h.p., have not yet been marketed. The Van Blerck has entered the field in two types—a 135 h.p. and a 200 h.p., all steel. One is an eight and the latter a twelve. The Packard motor car company announces a 12-cylinder aero engine, and the Roberts company is now building a number of their two-cycle motors of 325 h.p. each. These will be eights.

During October, 1915, 32 aeroplanes, valued at \$367,776 (£73,550), and parts at \$71,027 (£14,200) were exported. For October, 1914, the exports of planes and parts together totalled but \$18,968 (£3,800), while for the ten months ending October the total was \$214,057 (£42,800). Imports of aeroplanes and aeroplanes in warehouse were not separately listed during 1915. For the year 1915 a considerable number must be considered, as they were shipped from the

Curtiss Canadian factory, and would not be included in the export figures of the United States.

Large Flying Boats

The foreign field for large weight-carrying machines, so necessary in war service, forced attention to this type, and the Curtiss aeroplane company has produced a number of machines of the "transatlantic" type originally designed for Rodman Wanamaker's attempt to cross the ocean. Now a huge machine, also a flying boat, is in the works, to be equipped with a thousand horse power—four motors of 250 h.p. each, now in course of design and construction. The Christmas Aeroplane Company, a re-convert to the air "game," claims an order for some machines which will have 1,600 h.p. each, fitted with several rapid-fire guns, bombs and bomb-dropping devices, and to have a crew of eight. The Benoist Aircraft Co. has just finished demonstrating a 6-passenger flying boat, with two 100 h.p. two-cycle Roberts motors driving twin propellers, and has started the construction of a larger one which will have two motors of 325 h.p. each, also Roberts. The Thomas Company has produced a larger flying boat, and one or two others are making plans for monster aircraft.

This sudden demand for great power has induced the study of the steam engine, and one type may be expected to enter the field for aeroplane business in the near future.

Naval Dirigibles

With the \$1,000,000 (£200,000) allotted the Navy in 1915 by Congress a non-rigid 175-foot dirigible was ordered from the Connecticut Aircraft Co. and is now ready for delivery, awaiting the completion of the floating shed especially designed by the Office of Naval Aeronautics under Captain Mark L. Bristol, and will be stationed at the Pensacola Aeronautic Station.

Patents and Litigation

The Wright-Curtiss suit was to have been heard last June, but it has been postponed from time to time. It is expected that the new owners of the Wright Company will prosecute this new suit against the present Curtiss company with vigour. It will be remembered that Orville Wright, who acquired complete control of the company in 1915, sold his interest in the autumn to New York capitalists.

An important patent was allowed Glenn H. Curtiss on the combination of a central floating body portion and aeroplane wings which seems to cover the hydro-aeroplane and flying-boat field. A patent on the balancing floats under the wing tips is still in the office, and a battle is being waged between Curtiss and another inventor who claims priority of conception, though he never built a full-sized machine. Thus far the balance is with Curtiss.

Aeronautics in the Naval Militia

An effort was made during 1915 to interest the Naval Militia, which is composed of State organisations, in aeronautics. They were urged, in 24 States and the District of Columbia, to organise aeronautic sections and divisions, two sections making a division, under a plan evolved by the Division of Naval Militia Affairs of the Navy Department allowing the forming of an aeronautic section with 5 officers and 18 enlisted men, with the privilege of borrowing aircraft from the Navy Department, obtaining instruction in aeronautics at naval aeronautic stations, etc. But one division was formed, and that in the District of Columbia. Lack of funds prevents the purchase of aeroplanes by the Militia, but some money could have been had from the national aeroplane fund started by the Aero Club of America and other bodies, and doubtless individuals would have donated machines had sections and divisions actually been organised and a serious start made. The money

allotted the Naval Militia by Congress is not sufficient even to buy uniforms and other necessary equipment.

Civilian Naval Reserve

The Secretary of the Navy is planning some sort of an aviation corps with inducements to civilian flyers. The members of this branch would not, under this idea, be commissioned in the line; they would be merely trained skilful aviators. This plan will be objected to by the aeronautical experts of the Navy.

The National Guard in Aviation

The National Guard of each state is on a similar plane with the Naval Militia. Very little has been done. Most states report lack of funds. In some states a part of the Signal Corps of the N.G. has been assigned to study aeronautics. Some aeroplane companies have promised cut rates on aeroplanes or instruction free whenever aeronautic branches are organised, and in Nebraska a private owner has offered a machine on which instruction is now being given, and it has taken part in some special aerial manoeuvres. Some of the National Guard organisations number among members pilots, and that is as far as they have gone. The Aero Club has offered some donations of money, and in several states movements have been started to raise funds by public subscription.

Each state is the sole judge of what units of organised Militia, if any, it shall maintain; and if they conform to the Federal standard they may share in the benefits of the funds appropriated by Congress for the support of organised militia. There is no special fund for aeronautics. While the War Department is anxious that there should be an aero squadron in each of the Militia Division Districts, none has so far been organised. When units have been organised with proper State assurance as to equipment, they will be recognised by the War Department. The initial cost of an aero squadron is about \$256,000 (£51,000), and the maintenance of each machine averages about \$5,000 (£1,000) per year. Machines have to be replaced about once a year. The various states can use any part of the Federal funds allotted to the Militia for the purchase of any kind of military equipment they desire. If Militia funds are not available for the purchase of aeroplanes, it is because the Militia spends money for other purposes. The equipment of an aero squadron is as follows: 6 motor cycles, 8 aeroplanes, 16 auto trucks (8 as aeroplane carriers, 1 as machine shop, 1 as tank, 5 with supplies, 1 with baggage and rations).

The Year in the Navy

In the annual report of the Secretary of the Navy, Congress is asked for \$6,000,000 (£1,200,000) for aircraft service during a five-year period. \$2,000,000 (£400,000) is for the first year (available in 1916), and \$1,000,000 (£200,000) each for the subsequent four years. The General Board of the Navy, however, figures \$3,000,000 (£600,000) for the coming year, or \$7,000,000 (£1,400,000) in all.

The first specific appropriation for naval aeronautics was of \$1,000,000 (£200,000), and this was available in 1915. Prior thereto money was used from unexpended funds under other headings. Pensacola, Florida, has been established as a Naval Aeronautic Station, and the buildings of that abandoned navy yard have been put in condition. Its ideal location and the investment of over \$7,000,000 (£1,400,000) in this navy yard is now being utilised. Here experiments of all sorts are being carried out, such as efficiency of different oils and petrol; tests of different types of floats for aeroplanes, instruments, life preservers for aviators, special clothing. A launching device has been installed on a battleship and used to launch aeroplanes from the ship under way. All sorts of climbing and endurance tests are conducted. A special hoisting system has been tried out.

On July 1, 1914, there were 7 Navy air pilots fully qualified as aviators, 2 student aviators and 31 enlisted men trained as air mechanics. Since then officers and men have

been regularly detailed to this duty every three months. There are now in the service but 18 qualified aviators who have been appointed Navy air pilots, 16 student aviators, and 121 air mechanics. One of these is training for a dirigible pilot.

In July, 1914, the Navy had 9 aeroplanes and 21 motors. Nine aeroplanes were delivered and 7 motors were delivered



AVIATORS' LOOK-OUT

The illustration shows the look-out tower at the Pensacola U.S. Navy air station. From the small platform a small mast is erected for meteorological recording instruments, and the records are housed in a small house at the base of the tower. The platform is about 60 feet above the ground. The semaphore shows which aeroplane is out. As each machine goes out a bluejacket from its crew goes into the tower to follow it. A bell is hung to call crews together in case of need.

up to June, 1915. Twelve new ones have been built from spare parts on hand, and the total number that has been utilised is 28, although there were but 15 aeroplanes on hand on June 30. One dirigible, previously mentioned, 3 aeroplanes, and 4 motors ordered during the fiscal year ending June 30, 1915, have been delivered.

Out of the \$1,000,000 available on July 1, 1915, there have been ordered 20 aeroplanes, 73 aeromotors, 1 free balloon, 1 floating dirigible shed, 1 hydrogen plant for dirigibles, 1 set aeroplane sheds, and 1 aeroplane wrecking derrick, amounting to \$771,800 (£154,000). Repairs and operating expenses of these will amount to \$130,000 (£26,000), leaving \$98,200 (£20,000) available for contingencies and for the purchase of aircraft and machinery. When deliveries of above are made the Navy will have 38 aeroplanes.

(To be continued)

WRIGHT MODEL H.S.

THE public has not been treated as yet to a view of the model H.S. Wright, one of the types to be used in the new school at Augusta, Ga. This is a sort of land flying boat, from the appearance, as a fuselage is employed instead of the familiar tail outriggers. The entire frame of the fuselage is covered with wood, veneered on both sides with canvas. The engine is in the nose, driving through shaft past the seats to sprockets at the rear of the seats. The length is 26½ ft., front to rear, over all.

The landing gear consists of two wheels forward, mounted on a chrome-nickel steel axle, with eight rubber band shock absorbers under each wheel. A wood skid is at the rear mounted on a spring shaft.

The upper and lower wings have the same span, 32 ft., with a chord of 5 ft. 6 in. Wing frames and all uprights are made of wood, strongly braced with steel wires. Where necessary the wires are doubled. Control wires are also doubled.



THE NEW 70 H.S. WRIGHT BIPLANE

The pilot and passenger sit side by side in bucket seats of racing automobile type, with aluminium backs and leather cushions. In addition to the two occupants, the machine will lift, when loaded with fuel for four hours' flight, 300 lb. of dead weight.

The engine is a Wright six-cylinder 70 h.p.

As usual, the machine is a pusher, with two Wright propellers running in opposite directions at about half engine speed. The double-propeller machine was found the most suitable of all in the flights made by Lieut. Riley E. Scott when he won the Michelin bomb-dropping prize in France some years ago, as it could be kept in a straight course, which was an absolute necessity for the accurate dropping of bombs. The drive from the engine to the sprockets is flexible, and chain drive from sprockets to propellers.

The fuel tanks will hold sufficient petrol, oil, and water for six hours' continuous flight. The speed is claimed to be up to 78 miles an hour. The climbing rate is 400 ft. per minute, with two aboard and fuel for four hours' flight. The machine sells for \$6,000 (£1,200) at Dayton.

NOTES AND COMMENTS

An esteemed American contemporary describes a new engine, and says it is a "cylinder motor." This might have been overlooked had not the parlour experts called it to our attention.

Stories of the building of a dirigible by the Navy are not to be given any credence, Captain Mark L. Bristol, Director of Naval Aeronautics, says. All these refer to the one and only airship recently finished by the Connecticut Aircraft Co., and now stored in the Portsmouth (N.Y.) Navy Yard.

N.Y. NAVAL MILITIA TO BUILD OWN MACHINE

The Aviation Section of the First Battalion, N.Y. Naval Militia, foot of West 97th Street, New York City, will shortly be in going shape with ten or a dozen men as a start. They will be instructed in aeronautical mechanics and flying by Ensign Lee H. Harris. In addition to the flying boat presented this autumn by Curtiss, the section will build a hydro-aeroplane of its own. Until the State makes provision for money aid for the section, it will make use of federal funds as far as possible under the rules covered in the review article in AERONAUTICS, and by private subscription thereafter.

ANOTHER NEW ENGINE IN U.S.

Jay Westerfield and Walter L. Fairchild, both remembered from early days of aeronautics in America, have been discovered by AERONAUTICS quietly at work on a new motor—a 150 h.p. six-cylinder and a 300 h.p. twelve-cylinder Vee. Naturally, this will eclipse everything on the market.

Walter Phipps, well known in the model business, has interested the Poulsen Iron Works in aeronautics, and is now in Canada building aeroplanes.

W. Irving Twombly, whose rotary aero-motor appeared some years ago and then disappeared, is no longer with the Aeromarine Plane and Motor Co., having re-entered the automobile business.

WILLIAM S. LUCKEY DEAD

William S. Luckey died on December 20 at Montreal as the result of injuries received in an exhibition flight at Sturgeon Falls on September 6. As he was just getting away the magneto failed, and without power to rise over some wires he tried to go underneath and could not escape a railroad embankment. The main spar of the upper wing broke and struck him in the back and injured the spinal column. Mr. Luckey was forty years old, and looked the prosperous business man, as indeed he was before taking up flying in 1912, when he learned at the Curtiss School and bought a machine.

He is known to aviation fame through his winning the Aeronautical Society's race round Manhattan Island on October 13, 1913, and the *Times* \$1,000 prize offered through the society to the winner. This was a memorable contest because of the bad weather, and the fact that every contestant who started completed the entire course and there was no untoward incident.

NEW CLUBS FORMED

Aero Club of Iowa, Grinnell, Iowa—E. B. Brande, president; J. L. Fellow, vice-president; Harold L. Beyer, secretary-treasurer. W. C. Robinson, cross-country record holder, and F. E. Spaulding are the other incorporators.

Aeronautical Society of California, Marsh-Strong Building, Los Angeles, California—Earle Remington, president.

Wichita Aero Club, Wichita, Kans.—Delos P. Woods, president; Hal M. Black, secretary.

Springfield Model Aero Club, Springfield, Mass.

Detroit Aero Research and Model Aero Club—Care of Wm. P. Dean, 1,363 Townsend Avenue, Detroit, Mich.

Elmwood School Model Aero Club, Orange, N.J.

Plattsburg Model Aero Club—Care of James Regan, jun., Plattsburg Barracks, Plattsburg, N.Y.

Model Aero Club of Oxford, Oxford, Pa.

Aero Club of the Northwest—W. E. Boring, president, 1,100 Hoge Building, Seattle, Wash.

Buffalo Aero Science Club—Care of Christian Weyand, 48, Dodge Street, Buffalo, N.Y.

AEROPLANE RAIDS, 1914-1915

ENGLAND

(The numbers in brackets denote the number of aeroplanes employed)

1914

- Sept. 22—Naval air raid on Düsseldorf and Cologne (3).
- Oct. 8—Naval air raid on Düsseldorf (2).
- Nov. 21—Naval air raid on Friedrichshafen (3).
- Dec. 24—Naval air raid on Brussels.
- Dec. 25—Naval air raid on Cuxhaven (7).

1915

- Jan. 22—Naval air raid on Zeebrugge.
- Feb. 11-12—Combined raid on Belgian coast (34).
- Feb. 16—Combined raid on Ostend, etc. (48).
- Mar. 9—Six British officers attack Ostend.
- Apr. 16—Three British Officers bomb El Sirr (Suez Canal).
- June 7—Raid by nine seaplanes over Ak Basch.
- July 14—Allied raid on Ghent and Zeebrugge.
- Sept. 8—R.N.A.S. bombard Ostend.
- Sept. 22—Allied raid on Bruges, Middelkerke and Westende.
- Nov. 29—Attack on German aerodrome at Gits and ammunition factory at Lachapelette.
- Nov. 30—Twenty aeroplanes attack Miraumont supply depot.
- Dec. 2—Raid on Don station and munition store.
- Dec. 8—Sixteen aeroplanes bombard Miraumont depot and Hervilly aerodrome.

FRANCE

1914

- Aug. 18—Bombs on Metz airship shed.
- Dec. 4—French squadron bombard Freiburg-in-Breisgau sheds.
- Dec. 9—Second Raid on above.

1915

- Jan. 20—Allied raid on Krupp Works at Essen (not confirmed).
- Feb. 16—Combined Anglo-French attack on Ostend, Middelkerke, Ghistelles and Zeebrugge (48).
- Mar. 26—Attack on Frescaty and Metz (10).
- Apr. 2—Raid on Vigneulles (Woevre) station and sheds.
- Apr. 16—Raid on German military buildings at Ostend (15).
- Apr. 16—Bombardment of Rothweil and Maisières-les-Metz.
- Apr. 20—Raid on electric power station at Lorrach.
- Apr. 28—Bombardment of Lorrach (9).
- May 27—Eighteen aeroplanes bombard Ludwigshafen.
- June 3—Twenty-nine aeroplanes bombard Crown Prince's Headquarters.
- June 15—Twenty-three aeroplanes bombard Karlsruhe.
- July 13—Thirty-eight aeroplanes bombard Vigneulles (Meuse) station.
- July 14—Twenty aeroplanes bombard Libercourt station (between Douai and Lille).
- July 16—Ten aeroplanes bombard Chauny.
- July 20—Six aeroplanes bombard Colmar station.
- July 21—Thirty-one aeroplanes bombard Conflans Junction.
- July 26—Twenty-nine aeroplanes bombard Nantillois station.
- July 29—Ypres-Roulers railway at Passchendaele; German bivouacs in Longueval district; German defence works near Reims; Burthecourt and Chatel stations.
- July 30—Forty-five aeroplanes bombard petrol factories of Pechelbronn.
- July 31—Aviatik works at Freiburg bombarded.
- Aug. 9—Thirty-two aeroplanes bombard Saarbrücken.
- Aug. 15—Nineteen aeroplanes bombard German park and depot in the Spada Valley.
- Aug. 23—Seven aeroplanes bombard Tergnier and Noyon.
- Aug. 25—Sixty-two aeroplanes bombard Dilligen Ironworks.
- Aug. 25—Sixty aeroplanes (Belgian, English and French) bombard Forest of Houthulst.
- Sept. 6—Forty aeroplanes bombard Saarbrücken.
- Sept. 13—Nineteen aeroplanes bombard Trèves.
- Sept. 21—Nineteen aeroplanes bombard Bensdorf Junction.
- Sept. 22—Raid on Stuttgart.
- Sept. 24—Raid on Sablons station at Metz.
- Sept. 30—Air squadron bombards Guignicourt.
- Oct. 2—Sixty-two aeroplanes bombard Vouziers station.
- Oct. 2—Raid on Laon-Reims railway.
- Oct. 13—Nineteen aeroplanes drop 140 bombs on Bazancourt station.
- Oct. 13—Eighteen aeroplanes bombard the junction of Achiet-le-Grand, near Bapaume.
- Oct. 14—Renewed attack on Bazancourt by twenty aeroplanes.
- Oct. 16—Sablons station at Metz again bombarded.
- Oct. 17—Thirty shells dropped on Trèves.
- Nov. 15—Raid on gas factory at Dornach.
- Nov. 28—Ten aeroplanes bombard Habsheim (near Mulhouse).
- Dec. 14—Eleven aeroplanes bombard railway station of Mülheim.
- Dec. 14—Twenty-two aeroplanes bombard enemy installation at Hauriaucourt.
- Dec. 14—Twelve Aeroplanes bombard Works at Hampont.
- Dec. 15—Raid on German aviation camp at Habsheim.
- Dec. 18 and 19—Raid on Metz.
- Dec. 20—Raid on Mülhausen.

AVIATION EVENTS OF THE WAR

1914

- Aug. 25—First Zeppelin Raid on Antwerp.
- Aug. 27—Aeroplanes used to send messages recalling German troops.
- Sept. 5—Japanese seaplanes drop bombs on Tsingtau Barracks.
- Sept. 5—German Air Raid on Ghent.
- Sept. 22—Bombs on Maestricht.
- Sept. 30—Japanese drop bombs on German vessels in Tsingtau Harbour.
- Oct. 2—First mention of Germans using Observation Balloons.
- Oct. 16—First Aerial Attack on Warsaw.
- Oct. 22—Admiralty report use of Naval Balloons.
- Oct. 31—Loss of H.M.S. *Hermes*.
- Nov. 14—Destruction of Petrol Tanks at Bruges.
- Dec. 16—German aeroplane takes part in S.W. African operations.
- Dec. 24—Attempted Air Raid on Dover.

1915

- Jan. 18—Re-organisation of the R.F.C.
- Jan. 22—Raid on Durkirk.
- Feb. 8—Violation of Swiss territory by German bombs on Largrin.
- Mar. 12—*Ilia Mourametz* takes part in Russian operations.
- Mar. 23—Austrian attack on Antivari.
- Apr. 8—New Ranks in the R.F.C.
- Apr. 11-12—Zeppelin Raid on Bailleul.
- Apr. 12—Dutch bring down German aeroplane near Goes.
- Apr. 16—Raid on Amiens.
- Apr. 16—French Airship Raid on Strasburg.
- May 1—Raid on Dunkirk.
- May 17—Sq. Com. Bigsforth attacks and damages a Zeppelin off Ramsgate.
- May 24—Austrian Air Raid on Venice.
- May 26—Attack on Ghent by the Allies.
- May 30—Italian Raid on Pola Arsenal.
- June 2—Air Raid on Calais.
- June 9—Loss of Italian dirigible in the Adriatic.
- June 11—Raid on Fiume by the *Citta di Ferrara*.
- June 17—Lt. Warneford brought down Zeppelin between Ghent and Brussels.
- June 17—Lts. Wilson and Mills attack Zeppelin Sheds at Evere.
- June 20—First appearance of *Fritz*.
- June 27—Friedrichshafen Zeppelin Sheds again attacked—M. Gilbert forced to land on Swiss territory.
- June 29—Two British aeroplanes bombard Otavi in South Africa.
- July 7—Allied aviators bombard Turkish aerodrome at Chanak.
- July 6—Aircraft bomb *Königsberg* in South-East Africa.
- July 13—Introduction of Government Scheme for Insurance against Air Raids and Bombardment.
- July 26—Germans attempt to destroy bridge across the Vistula at Warsaw.
- July 26—Italian dirigible bombards Oppachiasella.
- July 29—Explosion at Airship Shed, Wormwood Scrubs.
- Aug. 5—The *Citta di Jesi* brought down by Austrians.
- Aug. 7—Zeppelin bombards Red Cross trains in Poland.
- Aug. 11—Appointment of the Board of Inventions.
- Aug. 12—Zeppelin bombards Bialystok.
- Aug. 14—Allied aviators bombard Constantinople.
- Aug. 20—Italian raid on Aisowitz aerodrome.
- Aug. 20—French seaplane sinks Turkish transport.
- Aug. 21—Fl.-Lt. C. H. K. Edmonds sinks Turkish transport in the Dardanelles.
- Aug. 22—Germans use new anti-aircraft gun.
- Aug. 23—Dutch Guards fire on German aeroplane.
- Aug. 26—Sq. Com. A. Bigsforth destroys German submarine.
- Aug. 27—Mulheim station and electrical installation bombarded.
- Aug. 28—Attempted air raid on Paris.
- Sept. 5—Russian seaplanes drop bombs on Torpedo Boats.
- Sept. 8—Re-organisation of the R.N.A.S.
- Sept. 13—Appointment of Sir Percy Scott to take charge of the Air Defence of London.
- Sept. 14—M. René Besnard appointed Under-Secretary of Military Aeronautics in France.
- Sept. 23—Dutch neutrality violated.
- Sept. 29—Bombs on Aix-la-Chapelle.
- Sept. 30—The French dirigible *Alsace* bombards railway station near Vouziers.
- Oct. 1—Austrian aircraft over Roumanian territory.
- Oct. 3—Bombardment of Luxembourg.
- Oct. 3—Loss of the dirigible *Alsace*.
- Oct. 10—Creation of French Air Committee.
- Oct. 12—Russian aeroplane drops bombs on transport in the Tukum district.
- Oct. 12—German Bombardment of Dvinsk.
- Oct. 13—Russians capture German hydroplane of a new type between Lake Babit and Riga.
- Oct. 18—German bombs on Swiss territory.
- Oct. 21—Aircraft take part in the bombardment of Dedcagatch.
- Oct. 27—Russian seaplanes bombard Varna.
- Nov. 9—Appearance of new German warplane on Russian front.
- Nov. 20—Attempted air raid on Lunéville.
- Dec. 13—The Air Defence of London transferred to the War Office.



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SOME RECENT PILOTS' CERTIFICATES

[F. N. Birkett

First row (left to right)—Fl. Sub. Lts. W. S. Wilson, G. N. Lindemay, H. Tetber, J. C. Halliran.

Second row (do.)—Fl. Sub. Lts. W. H. Hope, E. T. Bradley, H. G. Hall, A. L. Greer.

Third row (do.)—Fl. Sub. Lts. A. T. Sketchley, P. S. J. Owen, H. L. Hitch, Lieut. W. R. Gainer, 13th Canadians.

Fourth row (do.)—N. Bangs, Fl. Sub. Lt. L. G. Scott, R. Braim, R. G. Begg.

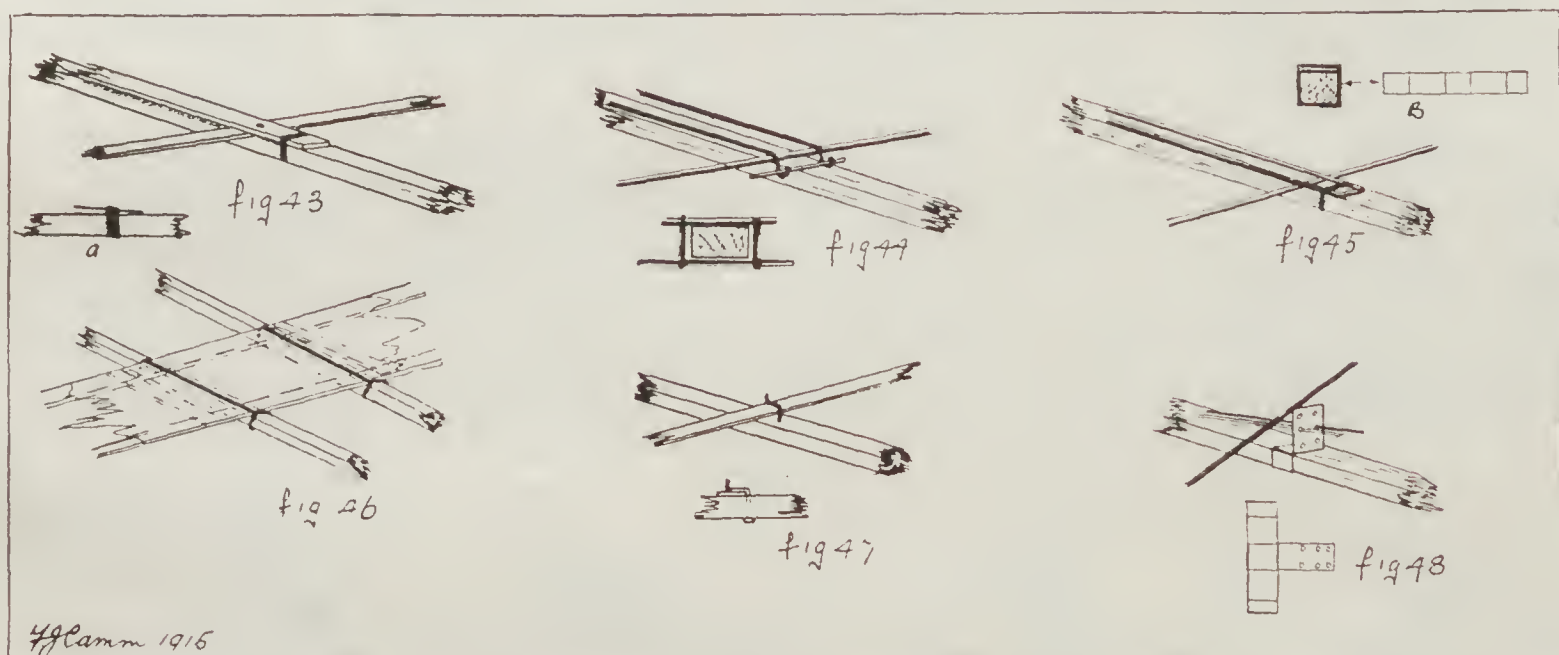
MODEL AEROPLANES—XXII.

By F. J. CAMM

WHEN adjudicating in model aeroplane contests for design and construction one not infrequently finds that machines possessing a good general appearance from two or three yards' distance are, upon closer acquaintance, sadly lacking in detail design—I refer to such points as elevator and main plane adjustment (the subject of this week's illustration) and points of like importance. Were models judged as oil paintings—from a distance—it would be difficult indeed to discriminate in some competitions where perhaps a dozen machines in general outline bear striking similarity to one another.

The point I desire to accentuate is that it is upon details that marks are awarded, for two machines in all respects similar at three yards' distance often, upon closer scrutiny, reveal the fact that one may possess, say, a neatly designed elevator adjustment, while the other's incidence device consists of a piece of twig poising the edge of the elevator out of the horizontal against the action of a rubber band.

passes under the spar and through the bends of the hooks. The upper sketch of this figure is a dissected view of the joint, the lower a cross-sectional view; or the wire wing could be attached as in Fig 45. Here again two wire central ribs are used, soldered to both edges of the wings, a tin strap following over the projections similar to Fig. 43. To the sectional sketch *b* is appended a plan of the strap. It should be bent round an odd piece of spar similar in section to the model it is intended for, plus the thickness of the gauge of wire, soldered up, and slipped on the spar when assembling the various parts. A very effective method of securing the wing to a two-membered fuselage is that drawn in the succeeding figure. Although it can hardly be termed an engineering job, this much can be said for it: it allows the wing to swivel in the event of this striking an object when in flight. I would recommend it as a *temporary* fixing, to be supplanted when the correct disposition of the surface has been found by the swivelling-pin device



So with main plane adjustments. An otherwise neatly constructed plane is sometimes found to be attached in the most slipshod fashion with thread binding, no provision having been made to adjust the wing or to admit of its detachment for portability. The root of success lies in first making a scale drawing of the proposed model, and thinking out each joint and portion of it. But to return to main plane adjustments.

The primary requirements of a main plane fixture are that it shall admit of a variation of the plane's disposition to obtain the essential coincidence of the centres of pressure and gravity. Secondly, it should allow of the plane's detachment so that the model can be packed into the smallest compass. Lastly, it must secure the wing rigidly to the spar, so that the wing does not rock on it under the pressure exerted upon it by gusts, etc.

In Fig. 43 I show a form of plane fastening which I have found to fulfil these requirements, and which I have used on nearly all my single-spar models. It consists of a tin strap, lapped and soldered together *underneath* the spar, which passes over an extension of the centre rib. This extension should be slightly chamfered on the top face to give it a lead into the fastening strap. The chamfer is shown at *a*. The centre rib should be of birch, since it has to withstand any wing tip knocks sustained by the model.

A simple yet effective method of securing a wire wing to the spar is that given by Fig. 44. The wing is provided with two ribs at the centre, spaced a distance apart equal to the lateral measurement of the spar. They continue over the leading edge and are bent down to form a hook, so that the hook just appears below the spar. All that is now necessary to secure the wing is a short piece of piano wire, which

sketched in Fig. 47. As shown, a pin (brass for preference) is forced through the spar, and cranked to grip the wing spar with sufficient friction without fracture.

A combined incidence and main plane adjustment is illustrated in Fig. 48. Two ribs from the main plane engage with suitable holes drilled in the upright arm, that portion of the fitting which engirdles the spar being capable of movement in a fore and aft direction—not too free, just sufficiently so to retain the position of the wing against the tendency of it to jolt forward under the impact of landing. In this respect it will be found expedient to mark the position of the wing on the spar, so that, should the wing inadvertently become detached, its position can readily be referred to.

(To be continued)

NAVAL CIVILIAN CONSULTING BOARD

A naval consulting board of civilian scientists was appointed by the Secretary of the Navy during the past year, and the Aeronautical Society of America was invited to name two on this board, of which Edison is chairman, and Hudson Maxim and Matthew B. Sellers, formerly on the staff of American *Aeronautics*, were appointed. Having lost its "place in the sun," the Aero Club of America sent letters to a list of people informing them they had been selected as members of the American Society of Aeronautic Engineers, and representations were made to Secretary Daniels which resulted in this new organisation being permitted to name Elmer A. Sperry and H. A. W. Wood. Several meetings of this consulting board have been held and various committees formed.

AIRCRAFT IN ACTION

OFFICIAL INFORMATION

ENGLAND

January 5—Raid on Douai—German Attack on Boulogne—"A number of our aeroplanes carried out a successful bombing raid against the enemy's aerodrome at Douai. A German aeroplane to-day flew over Boulogne and dropped a few bombs. No damage was done."

[The aerodrome of Douai is situated at La Brayelle, some four miles from the town, and was formerly a French air centre, while it served as the aerodrome for the Breguet firm.]

January 6—Raid on German Stores Depot—In addition to the raid on the aerodrome at Douai, another bombing raid was carried out yesterday (January 5) by 11 of our machines against a stores depot at Le Sars.

[See official report for January 5.]

January 8—Bombs Dropped Behind our Lines—"A German aeroplane dropped two bombs behind our lines north of the Somme to-day, but failed to do any damage."

ITALY

January 2—Enemy Aviators Active—Hostile aeroplanes dropped bombs yesterday (January 1) on Marco (Val Lagarina) and on Strigno and Borgo (Val Sugana) without doing any damage.

January 5—Austrian Aviators Driven Off near Verona—On January 3 two Austrian aeroplanes flew towards Verona, but were beaten back by the fire of our anti-aircraft batteries before reaching their objective. They fled in a northerly direction and dropped some bombs, which caused no damage.

January 6—Enemy Aircraft Active—Enemy aircraft continued to make numerous raids in the valleys of Lagarina, Bugana and Dogna, and in the Upper Isonzo. They dropped bombs in various places, which, however, did no damage.

January 7—Enemy Aircraft Active—"Enemy aircraft appeared over the valleys of the Upper Fella and the Upper Isonzo. They dropped some bombs, which did no damage."

DARDANELLES

January 1—Bombs on Battleships—Turkish official: "One of our aeroplanes successfully dropped bombs on an enemy camp near Sedd-ul-Bahr and on its transport. Another aeroplane dropped bombs on the battleship *Swiftsure*."

January 3—Successful Aerial Reconnaissances—Turkish official: "Our aviators flew over hostile positions and made successful reconnaissances."

January 6—The Work of the R.N.A.S. in the Dardanelles—From Sir Ian Hamilton's Despatch, dated December 11, 1915, describing the Suvla Bay operations in July, 1915.

"In bringing this despatch to a close I wish to refer gratefully to the services rendered by certain formations, whose work has so far only been recognised by a sprinkling of individual rewards.

"Much might be written on the exploits of the Royal Naval Air Service, but these bold flyers are laconic, and their feats will mostly pass unrecorded. Yet let me here thank them, with their Commander, Colonel F. H. Sykes, of the Royal Marines, for the nonchalance with which they appear to affront danger and death, when and where they can. So doing, they quicken the hearts of their friends on land and sea—an asset of greater military value even than their bombs or aerial reconnaissances, admirable in all respects as these were.

"With them I also couple the Service de l'Aviation of the Corps Expéditionnaire d'Orient, who daily wing their way in and out of the shrapnel under the distinguished leadership of M. le Capitaine Césari.

"The Armoured Car Division (Royal Naval Air Service) have never failed to respond to any call which might be made upon them. Their organisation was broken up; their work had to be carried out under strange conditions—from the bows of the River Clyde, as independent batteries attached to infantry divisions, etc.—and yet they were always cheerful, always ready to lend a hand in any sort of fighting that might give them a chance of settling old scores with the enemy."

January 7—Two Aeroplanes Brought Down—Turkish Official: "On the Dardanelles front a Turkish aeroplane shot down on January 6 a French Farman machine, number 42, east of Cape Naros, and an English aeroplane, which fell on the European coast east of Jalova. On the same day our aerial squadron successfully dropped bombs on enemy positions at Sedd-ul-Bahr and on the aerodrome in the Island of Imbros."

Another account states: "Lieutenant Ryck Boddike attacked a French aeroplane, which was flying over the Straits, and brought it down on the Anatolian coast near Akbauch. The French airman was found dead. The aeroplane can be easily repaired."

January 8—Bombs on Imbros Aerodrome—Turkish official: "A Turkish air squadron successfully dropped bombs on enemy positions near Sedd-ul-Bahr, and on an aerodrome on the island of Imbros."

BALKANS

January 5—Austrian Aeroplane Brought Down—Montenegrin report: "An Austrian aeroplane fell near Dulcigno. Its occupants were taken prisoners."

January 6—Austrian Aviators' Activity—Montenegrin official: "Austrian aeroplanes have been displaying particular activity to-day. They have dropped numerous bombs on our Lovcen positions and three on Cetinje without any result."

AUSTRIA

January 4—Russian Aeroplane Shot Down—On the Upper Ikwa troops of General Boehm Ermolli shot down a Russian aeroplane, and two officers were captured.

GERMANY

January 6—Two British Aeroplanes Shot Down—An enemy air squadron attack on Douai had no success. German battle aeroplanes shot down two English aeroplanes, one being shot down by Lieutenant Boelke, who thereby placed hors de combat his seventh enemy aeroplane.

FROM OTHER SOURCES

FRANCE

January 4—French Aviator's Escape—The two French aviators, Sergeant Madon and Corporal Chatain, who escaped to France after having been interned in Switzerland, as reported in our last issue, have been brought to Annecy where they have been examined by the general commanding.

January 6—Aviation in the French Senate—The Army Committee of the Senate to-day heard the report of MM. Gaston Menier, H. Chéron, and H. Bérenger, appointed to enquire into the condition of the French air service. Subsequently the Prime Minister, the Minister for War, and the Under-Secretary for Military Aeronautics gave explanations on the subject.

The report of the three delegates was unanimously adopted and placed before the Government and the President of the Republic.

French Aviation Programme—It was stated some days ago that the Army Committee of the Chamber of Deputies, after hearing the report of M. Leret d'Aubigny on the military aviation programme for the first quarter of 1916, adopted it unanimously. It now appears that only 12 members of the Committee, out of a total of 43, were present at the meeting, while MM. Adolphe Girod, Henry Paté and Camille Picard have since publicly dissociated themselves from the adoption of the report. The latter suggests that the aviation programme should be discussed after an explanation from the Under-Secretary for Military Aeronautics.

Aviation in the Chamber of Deputies—M. Paul Lafont, a Deputy and a certificated pilot, has asked the President of the Chamber for leave to interpellate the Government on the question of the aviation programme.

BELGIUM

December 31—Bombs on German Depots—From Ghent the *Echo Belge* learns that two Allied aviators yesterday (December 30) dropped eight bombs on some German military depôts, west of Roosebeke.

BALKANS

December 27—Allied Air Base at Kilkitch—The correspondent of the *Morning Post* in Budapest states that the base of the Allied air squadron is established at Kilkitch, where a large balloon shed has been built.

December 30—The Defence of Salonika—The work of fortifying Salonika has been favoured by fine weather, and is now nearing completion. Before approaching the town the German aeroplanes threw several bombs aimed at the British camp, but these fell wide of the mark.

At 12.30 midday and again at 4 p.m. a single enemy machine was seen hovering over the town, and was fired at with the same negative result. According to the *Patris*, pieces of the German air-bombs were afterwards bought for 4s. each.

December 30—French Aircraft over Monastir—A French aeroplane made a reconnaissance over Monastir, in consequence of which machine guns have been placed on the highest buildings.

December 31—The Aerial Attack on Salonika—The number of enemy aeroplanes that took part in yesterday's (December 30) raid is now known to have been six, of which three were Taubes and three Aviatiks.

January 1—Destruction of Krupp Works in Constantinople—The recent destruction by a French aeroplane of the Krupp munition factory in the Haskeui quarter of Constantinople has been admitted in a Turkish *communiqué*, which, however, attributes the disaster to the accidental explosion of some damaged dynamite which workmen were engaged in destroying. Private advices from Constantinople add that the explosion caused a destructive fire, whereby quite a half of the Haskeui quarter was reduced to ashes.

January 2—The *Nea Himera* states that one British soldier was killed and two were wounded by German air-bombs. The Greek Government has protested in Berlin against the raid.

January 2—It is reported from Salonika that the Allies have completely organised the air service, and enemy aviators are being pursued whenever they make their appearance. French aviators will in future almost continually keep guard over Salonika. Yesterday morning (January 1) a Taube flew over Salonika at an altitude of over 13,000 ft., and disappeared immediately in the direction of Ghevgeli.

January 3—French Bombard Strumnitza—French aviators in the last few days have made frequent flights over the enemy lines, and have dropped bombs on Petrich, Strumnitza, and other towns and villages where movements of troops were observed. Although they were fired on by the German artillery none sustained any damage. On the other

hand, it is believed that their bombs caused considerable casualties, especially at Petrich, where they were seen to explode in the middle of the town, causing buildings to collapse and fires to break out.

January 4—Bombs on Ghevgeli—During a reconnaissance flight Allied aviators dropped bombs on Ghevgeli and destroyed the hangars of the German air station there.

January 4—French Aeroplanes Active—The measures adopted by the Anglo-French at Salonika are now of an energetic character. French aeroplanes have made fresh excursions across the frontier. They bombarded a barracks, killing fifty Bulgarian soldiers, and also destroyed two bridges. The aviators report that they discovered no serious movement of the enemy, either towards Greek Macedonia or Southern Albania. The Bulgarian army appears to be paralysed; the Austro-Germans are still absent; and there is no trace of the Turks.

January 5—A telegram from Constantinople states that at the sitting of the Chamber (on January 5) several Deputies asked what reprisals the Government had adopted regarding the arrest of the Consuls of the Central Powers at Salonika. Talaat Bey replied that the Consuls were arrested under the pretext that they made signals to aviators who appeared over Salonika. The Ottoman Government had protested through the American Embassy against this violation of international law.

January 5—French Aviator's Reconnaissance—“Air-scouts report heavy Germano-Bulgarian masses of troops are advancing along the Doiran-Gevgheli route. Fifteen thousand Austro-Germans are concentrated at Monastir. A Bulgarian division has left Struga for Albania. French aviators who flew over the enemy's lines beyond Petrich and Strumitza station, dropping numerous bombs, state that everywhere enemy bands are concentrating towards the frontier. Already seven Bulgarian and four German divisions are concentrated.”

January 6—Bombs on Anglo-French Camp—“Two German aeroplanes flew over Topsis this morning (January 6) and dropped bombs on the Anglo-French camp. There is no information concerning damage.”

January 7—Another Aerial Attack on Salonika—“This morning (January 7) the inhabitants were treated to another visit from a Taube, which dropped bombs on the Allied encampments outside the town. No special damage is reported. The aeroplane was heavily bombarded. The shooting was remarkably good. One shell seemed to burst a few feet away from the Taube, which faltered and then turned back, flying off to the north, followed by shell bursts.”

A later message states: “The Taube which was seen this morning was compelled to alight in our lines by a shell which apparently damaged its petrol tank, as a bright flash was seen in the body of the machine, which then turned and planed to the ground. It is reported that a second German aeroplane was also brought down this morning.”

January 8—Aircraft for Salonika's Defence—The Allied Forces at Salonika await the enemy with confidence. Large forces are continually being disembarked in the Gulf of Orfano, together with heavy artillery and numerous aircraft.

January 9—Aerial Activity—Reconnaissances by German aeroplanes on the whole Allied front have lately become very frequent, and this fact, in addition to other indications, supports the conviction that the German invasion in the direction of Salonika is imminent.

GERMANY

January 1—The Strafer's Prophecy—Count Zeppelin, in a speech which he delivered recently at Düsseldorf, is reported by the local newspapers as saying:—

“Speaking for myself and expressing the view of your Imperial Master, the war will not last two years. The next few months will see German arms march rapidly from triumph to triumph, and the final destruction of our enemies will be swift and sudden. Our Zeppelin fleets will play an important part in future operations and will demonstrate more than ever their power as a factor in modern warfare.”

January 1—The Defence of Wilhelmshafen—The *Vossische Zeitung* gives some particulars about the defence works of the German naval base at Wilhelmshafen. The enormous requirements of the war have made further extensions necessary. There has been built a special department for the building of hydroplanes, and works for defence of the enormous stocks of various materials against hostile attacks. Wilhelmshafen before the war had been already strongly fortified towards the sea, and it is now also fortified towards the land.

January 6—The Kaiser in a Zeppelin Accident—The following account of the Kaiser's trip in “L 18” is supplied by the correspondent of the *Morning Post* in Petrograd: “The *Bourse Gazette* contains an interesting and circumstantial account of a flight in a Zeppelin which nearly cost the Emperor William his life. It has been officially denied in Germany that his Majesty was aboard the ill-fated Zeppelin, but the crew and officers were especially rewarded, according to the *Kriegs Zeitung*, for ‘saving the Emperor's life during a flight at the front.’ The Zeppelin was ‘No. 18,’ and sleeping, working, and reception rooms had been specially fitted for his Majesty. Most of the details have been obtained from intercepted letters, from which the *Bourse Gazette's* correspondent pieces together the following story. The Zeppelin in question was the flagship of the first light squadron of airship ‘Dreadnought’ cruisers. The observation

cabin was fitted in the floor with a window constructed on the principle of binoculars magnifying seventeen times and measuring over a yard across. Among the other novelties were special parachutes to serve the purpose of lifebelts at sea in case of extremity. The Emperor wore pilot's kit.

“After several postponements this important flight of the Emperor was finally fixed for a day on which drizzling rain fell. The Zeppelin quickly rose above the clouds into brilliant autumn sunshine and landed quite regularly at Warsaw, where it was met by an Austrian Archduke and a guard of honour. The Emperor emerged, watch in hand, bidding those present to note how precisely punctual was the airship's arrival. Half an hour later the trip was resumed, apparently towards the fighting front of the German armies.

“It was now that things began to go wrong. The engines stopped and mechanics hastened along the corridors and climbed outside ladders. The Emperor was told that an accident, common enough with Zeppelins, had happened—namely, that one of the screws had broken and was tearing into the aluminium envelope and causing a wastage of gas. This screw was to be changed while moving, and, after it had been isolated, the engines started again for home. Spare screws are always carried. Nevertheless, the repairs seemed to be inadequate and the loss of buoyancy increased beyond normal limits. The airship began to list heavily, and a parachute was prepared for his Majesty's use. The commander of the airship telegraphed to earth, and the whole countryside was quickly aroused, cavalry and motors flying in all directions in obedience to the notification to prepare for a descent at any moment and anywhere.

“The engines were stopped, and everything having weight was flung overboard, even the officers' swords being jettisoned. But the huge machine continued to fall until, by a great stroke of luck, its anchor caught some trees, and the airship reached the ground without actual disaster. Apart from official recognition by orders and medals, every officer and man concerned received special rewards from the German Emperor personally and the intercepted letters of pilots contain details of these awards.

[We give this yarn for what it may be worth, and beg to refrain from comment.—Ed.]

January 8—Zeppelin Damaged—Reports from Belgium state that a Zeppelin flew over Namur on Friday morning (January 7), but had to descend owing to the gale. The landing operations were not a success, and the airship fouled some telegraph wires and was wrecked. Two of the crew were killed. The airship, which was one of the last left in Belgium, was taken to Namur for repairs. The pilot is reported to have been arrested.

[Until confirmation of rumours of this kind is forthcoming it will be well to suspend judgment.—Ed.]

January 9—Zeppelin Threats—Referring to the publication in all the German newspapers of yet another map of the “fortifications of London,” the military *Kreuz Zeitung* says:

“We hope that we may see in this an indication that, after so long a pause, new Zeppelin attacks on the English capital are imminent. The full and ruthless use of all weapons which are at our disposal against England is not only justified in the highest degree by England's brutality in the conduct of war, but is also a dictate of humanity in as far as one may expect from it a shortening of the war.”

MESOPOTAMIA

Aeroplanes in the Battle of Ctesiphon—The following extract relating to the presence of aircraft at the Battle of Ctesiphon is contained in an officer's letter describing his experiences: “on November 25 we got some supplies up, and sent out burial parties over as much of the battlefield as possible. That evening the aeroplanes reported that the Turks had been again reinforced, and estimated their strength at 20,000. We went out to battle at Ctesiphon in strength, and our casualties were 4,500 (about 800 killed).”

AN AIR FIGHT AGAINST ODDS

The two officers of the Royal Flying Corps in France returned as missing on December 1—Lieutenant D. W. Grinnell-Milne, 7th Royal Fusiliers, pilot, and Captain C. C. Strong, 13th London Regiment, observer—have now been reported as unwounded prisoners in Germany. Their aeroplane was forced to descend by the bursting of a cylinder in the enemy's lines near St. Quentin, on December 1, but the aviators were able to burn the machine before being made prisoners.

It now appears that it was these officers who were engaged on November 28 in the very gallant fight against odds. This fight was described by a correspondent in the following terms:—

“A British machine was engaged in heading off an Albatros, which was flying over our lines when the enemy was suddenly reinforced by two Fokkers. Nevertheless, the two British aviators in their machine continued to attack the Albatros, and eventually manoeuvred near enough to be able to fire at it at close range. The Albatros was obviously hit, for it suddenly nose-dived to the earth and was seen to turn right over as it landed. The two Fokkers were now joined by two more German machines, while one of our scouts came up to the rescue of our men. The battle was continued for some time by the gunners on both sides, but eventually the Germans gave up the struggle and disappeared homewards, leaving our machines unhit.”

The Reuter account of the engagement added that our machines chased the German aviators for something like 20 miles before they returned to our lines.

BRAZILIAN AVIATOR FOR FRANCE

One of the best Brazilian aviators, M. Edie Chabes, of Sao-Paulo, left some days ago for France in order to enlist in the air service. M. Edie Chabes is a member of one of the most distinguished families of Sao-Paulo.

THE LIGHTS OF PARIS

General Maunoury, the Military Governor of Paris, has expressed his willingness to do all that is possible to remedy the grievances of Parisians arising out of the subdued lighting of the streets, with due regard, however, to the defence of the capital against aerial attack.

A FIGHT AT 2,500 METRES

This is a story of a certain French pilot not unknown to England, whom we may call N. This exploit won for him the Legion of Honour.

Setting out early in the morning of November 28 on a single-scatter to make a trial flight, and if possible to fire a few rounds from his machine gun, he suddenly ran up against two Huns somewhere in the region of Nomenz. He promptly attacked, with the result that one of his opponents fled, while the other stayed to fight. Three or four times in succession the machines swept past one another, firing heavily. N., who had four strips of cartridges, only had one left. Hitherto he had been fighting at a distance of 100 metres, but now, in order not to waste his remaining ammunition, he resolved not to fire again until he had approached to within ten metres of the Hun. He was flying parallel to his opponent, a little in front and at the same height in order to avoid being hit; then at the right moment he banked over steeply until he was below the enemy machine about fifty metres behind its tail, and was consequently sheltered for the time being. Seeing his target so close, he had to restrain himself with all his might from firing his last cartridges. The enemy obviously thought that N. had expended all his ammunition, and continued firing both his guns without the slightest result. Climbing rapidly, N. presently got within ten metres of the enemy, let go his controls, got up, sat down on the little seat behind, aimed, and fired off his last twenty-four cartridges, all of which hit the mark. The Hun dived with motor full on, the pilot evidently having been killed. The machine fell like a stone and very nearly struck our pilot, who only just managed to get out of the way by swerving sharply to the right. Five hundred metres lower down the Hun burst into flames, and went spinning down to earth. A small heap of charred remains was all that was left of it.

ART TREASURES AND AIRCRAFT RAIDS

It is understood that the Office of Works recently summoned a conference, which was attended by representatives of the Admiralty and the War Office, and to which the directors of the great museums and art galleries were invited, to consider whether any further steps could be taken to safeguard national monuments against aircraft raids. The naval and military experts present unanimously agreed that no public building could by any structural device be protected against attack by bombs. Steps have, however, been taken to protect as far as possible the chief art treasures of the country.

JOHORE'S AEROPLANES

The Sultan of Johore has forwarded a draft for £2,492 as a contribution from his Government, to be used in such manner as the Army Council may think best. The Army Council have gratefully accepted this generous gift, and propose to devote it to the provision of reconnaissance aeroplanes for the use of the Royal Flying Corps.

STATEMENTS IN PARLIAMENT

January 4—Anti-Aircraft Defence of London—Mr. Tennant (Under Secretary for War), being asked by Mr. King (L., North Somerset) whether he could make a statement about any recent developments or changes in the anti-aircraft defences of London, replied that it was not in the public interest that any such statement should be made. He was, however, able to say that Sir Percy Scott is still in charge of the anti-aircraft guns.

January 4—The Aircraft Service—Mr. Lynch (Clare, W., Nat.) asked the Under-Secretary of State for War whether, without giving hurtful information to the enemy, he could state what progress had been made in developing the air-craft service during the last three months, particularly in regard to the construction of large aeroplanes utilising several engines capable of developing great horse-power and of attaining a high rate of speed.

Mr. Tennant: I am, of course, always glad to give, through the medium of answers in this House, information which is hurtful to the enemy, and I may state that aeroplanes of the type mentioned in the latter part of the question are being constructed from several different designs.

Mr. Lynch asked whether the construction of this type of aircraft was being pushed forward at the greatest possible rate, and Mr. Tennant replied that he thought he could give the hon. member the assurance he sought.

HONOURS FOR FRENCH AVIATORS

MENTIONED IN DESPATCHES

M. Paulhan, who was with the French Military Mission in Serbia, has been mentioned in Army Orders as follows: "After having pursued enemy aeroplanes that had just effected a bombardment this officer pursued one of the machines he had defeated in a battle, where he showed the greatest coolness. He hovered over the machine, which fell in the enemy's country, to drop a bomb on it."

LEGION OF HONOUR—CHEVALIER

Lieut. Dardayrol, Observer, Squadron M.F. 8.
Lieut. de Peyrecave de Lamarque, Squadron C. 61.
Adjutant-Pilote Nungesser, Squadron 65.

CASUALTIES

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR
Grinnell-Milne, Lieut. D. W., Royal Fusiliers and Royal Flying Corps.

ROYAL NAVAL AIR SERVICE

SLIGHTLY WOUNDED

December 28

Munday, Flight Sub-Lieut. Richard B., R.N.

ROYAL FLYING CORPS

KILLED

December 30

Cleaver, Second Lieut. D. C., R.F.C.

Second Lieut. Digby Crunden Cleaver, Royal Flying Corps, who was killed in France on December 29 by being thrown from an aeroplane which capsized while he was flying as a passenger, was the younger son of Mr. and Mrs. Howard C. Cleaver, of Shoreham, Sussex. He was educated at Hurstpierpoint College, Sussex, and at Château de Vidy, Lausanne, whence he returned in August last to enter the Royal Flying Corps. He was eighteen years of age, and as a Boy Scout was the first to fly in an aeroplane. He obtained his pilot's certificate in five days.

WOUNDED

December 23

Lusted, 1845 Serg. G. J., Royal Flying Corps.

December 24

Wright, 5266 Second Class Air Mechanic A., Royal Flying Corps.

December 28

Alchin, Lieut. G., R.F.A., attached Royal Flying Corps.

MISSING

December 28

Porter, Capt. G. T., R.F.A. and Royal Flying Corps.

December 29

Head, Second Lieut. F., Royal Flying Corps.

Pitt, Second Lieut. G. L., Royal Flying Corps.

December 30

Glen, Second Lieut. D. A., Manchester Regt. and R.F.C.

DIED

Undated

Reed, Second Lieut. P. M., 8th Somerset L.I., and R.F.C.
Second Lieutenant Paul Maurice Reed, Somerset Light Infantry, 8th Battalion, and Royal Flying Corps, who has died while on active service, was the eldest son of Mr. T. M. Reed, a well-known Bridgwater solicitor. He was nineteen years of age, and was, before the war, articled to his father. Enlisting as a private immediately hostilities commenced, he was given his commission in December of last year, being gazetted to the 8th Somerset Light Infantry. Later he was transferred to the Royal Flying Corps, and a little more than two months ago left for Egypt. His death took place on December 28.

INDIAN FORCES

MISSING

Undated

Cunningham-Reid, Second Lieut. D. F., I.A., Reserve of Officers, attached Royal Flying Corps.

Strover, Lieut. E. J., 3rd Brahmans, attached Royal Flying Corps.

UNOFFICIALLY REPORTED KILLED

January 8

Yule, Second Lieut. L. W., R.F.C.

Second Lieut. Louis William Yule, Royal Flying Corps, No. 7 Squadron, previously reported missing, is now known to have been killed on September 26 last, aged 18 years. He was educated at Wellington College and obtained a temporary commission in the 10th Royal Warwickshire Regiment in September, 1914, becoming Second Lieut. in the Royal Flying Corps last May. He was mentioned in despatches published on January 1 last. Mr. Yule was the youngest son of the late Col. W. A. Yule, Royal Scots Fusiliers.

Capt. J. D. G. Sanders, Royal Artillery and Royal Flying Corps.

Captain James Donald G. Sanders, Royal Artillery and Royal Flying Corps (died on January 6 of wounds received in France), was born in August, 1886, and passed from Woolwich into the Royal Artillery in July, 1906. He was promoted in July, 1909, and received his captaincy in October, 1914—the same month that he became attached to the Royal Flying Corps. He was gazetted Flight-commander in February, 1915. For three years from June, 1911, he was employed with the West African Frontier Force. Captain Donald Sanders was the elder son of Mr. James Sanders, late I.C.S., and Mrs. Sanders, of The Warren, Weybridge.

APPOINTMENTS

ROYAL NAVAL AIR SERVICE

Commander:

R. Hunt graded in R.N.A.S. as wing commander, to date November 11.

Flight-Commander:

The Hon. W. Forbes-Sempill (Master of Sempill) granted a commission as flight-commander for temporary service, and appointed to the "President," additional for R.N.A.S., to date January 1.

Sub-Lieut., R.N.A.S. (temporary):

Petty Officer B. Lemon, R.N.V.R., and appointed to the "President," additional for R.N.A.S. for observer's duty, to date January 7.

The following have been entered as probationary Flight Sub-Lieuts. temporarily, and appointed to the "President," additional, for R.N.A.S., to date as follows:

M. Evans: January 10; W. Walker: November 24; C. Wyatt, December 6; W. Edward: December 16; H. Arundell: December 10; J. Harman: December 9; J. Gorman: December 5; J. Galpin: November 26; and W. Mackenzie: December 11.

Temporary Acting Flight Lieut. N. Pemberton-Billing has been promoted to rank of Temporary Squadron Commander: January 1.

Temporary Lieutenant:

S. J. V. Hill (R.N.V.R.), to the *Empress*: January 2.

Probationary Flight Sub-Lieutenants:

The following have been entered for temporary service, with seniority of December 16, and appointed to the *President*, additional, for R.N.A.S.: B. N. Harrop, G. G. Avery, S. V. Trapp, and J. A. Glen.

Flight Lieutenant:

Acting Flight Lieut. T. A. Batchelor has been confirmed in the rank of Flight Lieut.: November 11.

Flight Sub-Lieutenants:

G. Donald, to the *Engadine*: January 2.

The following have been entered for temporary service: E. G. Cleverly, D. A. Mache: January 3.

Temporary Flight Sub-Lieuts.:

S. O. Smith, granted the acting rank of temporary Flight Lieutenant, with seniority of January 2, and appointed to *President*, additional, for R.N.A.S.

C. K. Chase (Corporal, Easton Machine-Gun Brigade), granted a temporary commission as Sub-Lieutenant (R.N.V.R.), with seniority of December 30, and appointed to *President*, additional, for R.N.A.S.

ROYAL FLYING CORPS

ATTACHED TO HEADQUARTER UNITS

Brigade Major:

Capt. B. C. Fellows, retired pay, I.A., from a Wing Adj., R.F.C.: December 18.

Following appointments are made:—

Central Flying School—Commandant:

Capt. (temp. Lieut.-Col.) D. de G. Pitcher, 39th King George's Own Central India Horse, I.A. from Wing Commander, and to retain his temporary rank whilst so employed, vice Capt. G. M. Paine, C.B., M.V.O., R.N.: December 10.

Central Flying School—Officer of Experimental Flight (graded as a Squadron Commander):

Lieut. (temp. Capt.) G. L. Cruikshank, D.S.O., Gordon Highlanders, Flight Commander, Military Wing, and to temporary Major whilst so employed, vice Lieut. (temp. Major) E. L. Conran, 21st Lancers: December 7.

Central Flying School—Instructor:

Lieut. (temp. Capt.) H. R. Nicholl, S.R., a Flight Commander, Military Wing, and to retain his temporary rank whilst so employed, vice Lieut. (temp. Capt.) J. E. Tennant, Scots Guards: December 12.

Flying Officers to be Flight Commanders:

Capt. R. G. Cherry, R.A.; Capt. H. F. A. Gordon, York and Lancaster Regt.: December 7. To be temp. Capts. whilst so employed: Lieut. S. W. Smith, R.A.; Second Lieut. (temp. Lieut.) W. H. Primrose, Argyll and Sutherland Highlanders, T.F.; Second Lieut. (temp. Lieut.) J. E. A. Baldwin, 8th Hussars: Second Lieut. R. H. Carr, S.R.; Temp. Lieut. F. J. Powell, General List: December 15. Lieut. E. P. Graves, R.A.: December 17.

Flying Officers:

Temp. Lieut. J. Clisdal, General List; Second Lieut. F. W. Brett, S.R.: December 6. Second Lieut. A. W. Kilgour, S.R.; Temp. Second Lieut. J. E. Pike, Durham Light Infantry, and to be transferred to General List: December 9.

Capt. G. R. Howard, D.S.O., Essex Regt., S.R.; Lieut. G. A. Parker, Northamptonshire Regt., and to be seconded; Lieut. J. G. Selby, R.A., and to be seconded; Temporary Second Lieut. M. A. J. Orde, A.S.C., and to be transferred to General List; Second Lieut. G. J. Read, N. Staffordshire Regt., S.R., and to be seconded; Second Lieut. V. P. Cronyn, S.R.; Second Lieut. J. O. Andrews, R. Scots, and to be seconded: December 16.

Second Lieuts. (Special Reserve) C. I. Van Nostrand, F. C. A. Wright, C. L. Wilcox, D. Cox: December 18.

Appointment of Lieut. J. J. Hammond, Special Reserve, notified in *Gazette*, March 12, antedated November 26, 1914.

Aeronautical Inspection Department—Inspector of Engines:

Lieut. (temp. Capt.) R. H. Verney, A.S.C., from Equipment Officer, to retain his temporary rank whilst so employed, vice Capt. R. K. Bagnall-Wild, Reserve of Officers: December 14.

ROYAL FLYING CORPS—SPECIAL RESERVE.

Lieuts. (temp. Capts.) to be Capts.:

E. K. Davies, R. R. Smith-Barry, C. M. Crowe, H. C. Tower, G. C. N. Nicholson, F. H. Jenkins: December 1.

To be Capts.:

Lieut. E. G. S. Walker, Lieut. (temp. Capt.) G. H. Eastwood: December 1.

Second Lieuts. to be Lieuts.:

L. F. Page, W. A. G. Bellew, C. D. Fuller, J. O. Cooper, H. MacD. O'Malley, A. R. H. Browne, R. E. A. W. Hughes-Chamberlain, J. W. Woodhouse, A. C. Wright, F. W. Wright, A. FitzR. P. H. Somerset-Leeke, R. H. Carr, F. Dunn, J. P. C. Cooper, A. C. Horsburgh, D. A. C. Symington, H. K. Maxwell, K. D. P. Murray, S. E. Neal, W. D. S. Sanday, F. A. G. Noel, V. S. Brown, A. B. Adams, G. D. Pidgeon, F. S. Creswell, H. S. Ebben, G. D. Hannay: December 1.

Second Lieuts. (on probation) confirmed in their rank:

A. Hunt, S. Dalrymple, T. G. G. Bolitho, M. C. Evans, W. W. Stenning, C. G. Coc, A. E. Thorne, W. H. Date, R. K. C. Maguire, A. W. Kilgour, G. Jacques, E. S. Perrin, S. Allcnby, W. C. Green, F. W. Brett, J. W. Jardine, D. Cox, C. L. Wilcox, C. I. Van Nostrand, F. C. A. Wright.

To be Second Lieuts. (on probation):

H. J. N. Drope: November 30; E. B. Horlick: December 11. The surname of Second Lieut. (on probation) R. H. Cronyn is as now described, and not as stated in *Gazette* of December 22. V. C. Gordon, N. J. Macdonald, J. L. Dashwood, R. S. Carroll, W. O'Hara, R. H. Jarvis, W. L. Scandrett, R. H. Lane, T. L. Brennan, G. H. Armstrong, G. E. Hewson, J. B. Brophy: December 7. W. H. Tolhurst, P. Tremlett: November 15. M. V. Morgan: November 17. A. J. Johnston: November 25. K. E. Page, F. R. Hudson: December 13. G. F. Underwood: December 28. S. W. Dunkley: January 3. Second Lieut. W. C. Green is as now described, and not as stated in *Gazette* (November 5).

Staff Captain: Dated December 4, 1915

Lieut. A. J. L. Scott, Sussex Yeomanry, Territorial Force, from Flying Officer, Royal Flying Corps, vice Lieut. O. P. Graves, Royal Artillery. Dated December 17, 1915.

To be Temporary Second Lieutenant:

Air Mechanic J. L. Miles, from R.F.C.: December 14.

Reginald M. Motabhoj: December 23.

Second Lieut. (on probation) V. P. Cronyn confirmed in rank.

Lieuts., Canadian Militia, to Second Lieuts. (on probation):

G. M. Murray, W. C. Gage, W. L. Richards, C. E. Rogers, A. K. Tylee, J. S. Shaw, L. P. Watkins, E. J. Watkins, G. C. Husband, A. Ross, J. A. G. Gilroy, P. R. Meredith: December 7.

J. H. Kelly, N. C. Millman, C. E. Robertson.

ROYAL FLYING CORPS

Hampshire Aircraft Parks

Captain (temporary):

Honorary Captain in the Army James Edward Pearce: dated December 6, 1915.

The undermentioned to be Lieuts. (temporary), dated December 6, 1915:

Stanley William Hiscocks.

Percy Bishop.

Harold Grinstead.

Henry Leonard Hall.

The undermentioned to be Second Lieuts., dated December 6, 1915:

Frank Arthur Short, Thomas Henry Lister Salisbury, Aubrey Richard Langton, Algernon Hamilton Lister, Henry Dixon Teage, Arthur John Elliott.

Percival Edward Crosson to be Quartermaster with honorary rank of Lieut.: dated December 6, 1915.

OFFICIAL NOTICES

ROYAL AERO CLUB

AVIATORS' CERTIFICATES

The following Aviators' Certificates have been granted:—

- 2188 Lieut. Charles Darrell Merrett (51st Infantry Regt.) (Bristol Biplane, Central Flying School, Werribee, Australia). October 20, 1915.
- 2189 Lieut. Roderick Ross (34th A.E.) (Bristol Biplane, Central Flying School, Werribee, Australia). October 20, 1915.
- 2190 Lieut. Eric Glendower Roberts (48th Infantry) (Bristol Biplane, Central Flying School, Werribee, Australia). October 20, 1915.
- 2191 Lieut. Charles James Brookes, R.A.G.A. (Bristol Biplane, Central Flying School, Werribee, Australia). October 20, 1915.
- 2192 Lieut. Eric Roy Moseley (35th Australian Engineers) (Bristol Biplane, Central Flying School, Werribee, Australia). October 20, 1915.
- 2193 Lieut. Alfred William Leslie Ellis (64th Infantry Regt.) (Bristol Biplane, Central Flying School, Werribee, Australia). October 20, 1915.
- 2194 Lieut. Lawrence James Wackett (Australian Permanent Forces) (Bristol Biplane, Central Flying School, Werribee, Australia). October 20, 1915.
- 2195 Second Lieut. Victor John Whitaker (3rd Lincolnshire Regt.) (Maurice Farman Biplane, Military School, Shoreham). December 13, 1915.
- 2196 Second Lieut. Harry Turner Shaw (Loyal North Lancashire Regt.) (Maurice Farman Biplane, Military School, Shoreham). December 13, 1915.
- 2197 Flight Sub-Lieut. Alfred Milner Hughes, R.N.A.S. (Maurice Farman Biplane, Central Flying School, Upavon). December 16, 1915.
- 2198 Eric Blake Harvey (Maurice Farman Biplane, Central Flying School, Upavon). December 17, 1915.
- 2199 Flight Sub-Lieut. Donald Ernest Harkness, R.N.A.S. (Caudron Biplane, Royal Naval Flying School, Eastchurch). December 17, 1915.
- 2200 Lieut. Reginald Henry Marshall (3rd Northamptonshire Regt.) (Maurice Farman Biplane, Military School, Shoreham). December 17, 1915.
- 2201 Lieut. Hamish Strathy MacKay, R.G.A. (Maurice Farman Biplane, Military School, Shoreham). December 17, 1915.
- 2202 Edward Fenner Allen (Maurice Farman Biplane, Military School, Brooklands). December 19, 1915.
- 2203 Harold Hartley Baron (Maurice Farman Biplane, Military School, Brooklands). December 19, 1915.
- 2204 Charles Hurd Howell (Maurice Farman Biplane, Military School, Brooklands). December 19, 1915.
- 2205 Cecil Arthur Lewis (Maurice Farman Biplane, Military School, Brooklands). December 19, 1915.
- 2206 Lionel Alec Campbell Helbert (Maurice Farman Biplane, Military School, Brooklands). December 19, 1915.
- 2207 Second Lieut. John Humffreys Parry (3rd Buffs) (Maurice Farman Biplane, Military School, Shoreham). December 20, 1915.
- 2208 Second Lieut. Richard Malcolm Sisnett Shepherd (4th Royal Irish Regt.) (Maurice Farman Biplane, Military School, Shoreham). December 20, 1915.
- 2209 Second Lieut. Guy Herbert Boisragon Dent (2/1st Herts Yeomanry) (Maurice Farman Biplane, Military School, Shoreham). December 20, 1915.
- 2210 Serg. Francis George Stanley Williams (Royal North Devon Hussars) (Maurice Farman Biplane, Military School, Ruislip). December 20, 1915.
- 2211 Cyril Hart Collins (Maurice Farman Biplane, Military School, Birmingham). December 20, 1915.
- 2212 Second Lieut. Frederick John Terrell (8th Somerset Light Infantry) (Maurice Farman Biplane, Military School, Birmingham). December 20, 1915.
- 2213 Flight Sub-Lieut. Hugh Reston Aird, R.N.A.S. (Grahame-White Biplane, Grahame-White School, Hendon). December 22, 1915.
- 2214 Ernest Duveen (Maurice Farman Biplane, Military School, Ruislip). December 22, 1915.
- 2215 Maurice Medaets (Belgian subject) (L. and P. Biplane, London and Provincial School, Hendon). December 22, 1915.
- 2216 Flight Sub-Lieut. Frederick Somerville Wroth Savill Onley, R.N.A.S. (Beatty-Wright Biplane, Beatty School, Hendon). December 22, 1915.
- 2217 Flight Sub-Lieut. George Reginald Moody, R.N.A.S. (Grahame-White Biplane, Grahame-White School, Hendon). December 22, 1915.
- 2218 William Thomas Warren, Jun. (L. and P. Biplane, London and Provincial School, Hendon). December 28, 1915.
- 2219 Second Lieut. Christopher Monkton (Maurice Farman Biplane, Military School, Shoreham). November 22, 1915.
- 2220 Second Lieut. James Reginald Herbert (Maurice Farman Biplane, Military School, Farnborough). December 2, 1915.

- 2221 Second Lieut. Alfred Denison Pearce (12th Royal Warwickshire Regt.) (Maurice Farman Biplane, Military School, Birmingham). December 9, 1915.
- 2222 Second Lieut. Archibald Laurie Findlay (Seaforth Highlanders) (Maurice Farman Biplane, Military School, Thetford). December 13, 1915.
- 2223 Second Lieut. Herbert Lloyd Chadwick (16th Royal Warwickshire Regt.) (Maurice Farman Biplane, Military School, Thetford). December 13, 1915.
- 2224 Lieut. Harold Evans Hartney (28th Bn. Canadians) (Maurice Farman Biplane, Military School, Thetford). December 13, 1915.
- 2225 Second Lieut. Philip Hunt (2/1st Shropshire Yeomanry) (Maurice Farman Biplane, Military School, Thetford). December 14, 1915.
- 2226 Second Lieut. Henry Maurice Talbot-Lehmann (3rd Essex Regt.) (Maurice Farman Biplane, Military School, Thetford). December 17, 1915.
- 2227 Flight Sub-Lieut. William Hocking, R.N.A.S. (Maurice Farman Biplane, Royal Naval Air Station, Chingford). December 18, 1915.
- 2228 Flight Sub-Lieut. George William Biles, R.N.A.S. (Maurice Farman Biplane, Royal Naval Air Station, Chingford). December 18, 1915.
- 2229 Second Lieut. Edward William Wise Rebbeck (13th King's Royal Rifle Corps) (Maurice Farman Biplane, Military School, Thetford). December 19, 1915.
- 2230 Second Lieut. Victor William Harrison (13th Royal Fusiliers) (Maurice Farman Biplane, Military School, Thetford). December 19, 1915.
- 2231 Second Lieut. Norman Brearley (3rd The King's Liverpool Regt.) (Maurice Farman Biplane, Military School, Thetford). December 20, 1915.
- 2232 Second Lieut. George Douglas Fletcher Keddie (1st Bn. London Rifle Brigade) (Maurice Farman Biplane, Military School, Thetford). December 20, 1915.
- 2233 Second Lieut. Leslie Oakes Crowther (9th Royal West Kent Regt.) (Maurice Farman Biplane, Military School, Shoreham). December 20, 1915.
- 2234 Lieut. Roland James Mounsey (Maurice Farman Biplane, Military School, Farnborough). December 20, 1915.
- 2235 Second Lieut. Vivian Llewellyn Andersson (4th Argyll and Sutherland Highlanders) (Maurice Farman Biplane, Military School, Thetford). December 20, 1915.
- 2236 Second Lieut. Lile Frederick Coulman, R.G.A. (Maurice Farman Biplane, Military School, Thetford). December 20, 1915.
- 2237 Second Lieut. Alfred Owen Shalders (2/1st Surrey Yeomanry) (Maurice Farman Biplane, Military School, Thetford). December 20, 1915.
- 2238 Second Lieut. Reginald Walter Le Gallais (Maurice Farman Biplane, Military School, Birmingham). December 28, 1915.
- 2239 Edward Ronald Yates (Grahame-White Biplane, Grahame-White School, Hendon). December 28, 1915.
- 2240 Victor Marcel Charles Barrois de Sarigny (Maurice Farman Biplane, Military School, Birmingham). December 28, 1915.
- 2241 Second Lieut. Reginald Arthur Stubbs (4th Royal Munster Fusiliers) (Maurice Farman Biplane, Military School, Shoreham). December 5, 1915.
- 2242 Lieut. Henry Vivian Acland (48th Batta. C.E.F.) (Maurice Farman Biplane, Military School, Norwich). December 9, 1915.
- 2243 Second Lieut. Robert Horne Sievwright (Royal Inniskilling Fusiliers) (Maurice Farman Biplane, Military School, Birmingham). December 28, 1915.
- 2244 Robert Kilpatrick Muir (Maurice Farman Biplane, Military School, Ruislip). December 28, 1915.
- 2245 Flight Sub-Lieut. George Leigh Hartgill, R.N.A.S. (Maurice Farman Biplane, Royal Naval Flying School, Eastchurch). December 29, 1915.
- 2246 Second Lieut. Charles Walter Hyde, R.G.A. (Maurice Farman Biplane, Military School, Birmingham). December 30, 1915.
- 2247 Second Lieut. Arthur Lionel Gordon Kidd (Maurice Farman Biplane, Military School, Birmingham). December 30, 1915.

AMERICAN CERTIFICATES

- 364 John Galpin (Wright Biplane, Wright School, Dayton, Ohio). November 24, 1915.
- 365 Basil D. Hobbs (Wright Biplane, Wright School, Dayton, Ohio). December 2, 1915.
- 366 James Lindsay Gordon (Wright Biplane, Wright School, Dayton, Ohio). December 2, 1915.
- 367 William Edgar Robinson (Wright Biplane, Wright School, Dayton, Ohio). December 7, 1915.

AERONAUT'S CERTIFICATE

The following Aeronaut's Certificate has been granted:—

- 58 Second Lieut. Henry George Bond (9th The Buffs). December 29, 1915.

PROGRESS AT THE FLYING SCHOOLS

The London and Provincial School—Pupils doing rolling—Verbessen, Darwin, Henderson, Egelstaff, and Snow. Pupils doing straights—Van Roggen and Thorp. Instructors: W. T. Warren, M. G. Smiles, C. M. Jacques, H. Sykes, and W. T. Warren, jun. Several days this week have been too windy for school work.

Ruffy-Baumann School—Owing to the repeated bad weather most work has been effected inside the sheds this week, but in spite of the inclement conditions some flying has been done by the following pupils, Flanders, Hamtiaux, Pauli, Vernon, Griffith, de Launoit, Muspratt, Thomsen, Durand, Edgar, Winter. Machines in use—50 and 60 h.p. Gnome-Caudron type dual-control biplanes. Instructors: Edouard Baumann, Felix Ruffy, Ami Baumann, Clarence Winchester.

The Grahame-White School—Civilian School: Straights with Instructor—Butler, Leigh, McClaughrie, Grasset, Hallet, Hathaway, Howe, Matthews, Parkinson, Smith, and Verguill—*R.N.A.S.*: Straights with Instructor: Prob. Flight Sub-Lieutenants Aitken, Burden, Colquhoun, Cook, Cuckney, Jones, Newton, Rampling, Roach-Smith, Rockey, Templeton, and West. Brevet during week: Prob. Flight Sub-Lieutenant Horniman. Instructors during week: Manton, Pashley, Russell, and Winter.

The Hall Flying School—The following pupils were out receiving instruction during the past week:—With Cecil M. Hill and H. Stevens:—Redford, Nicolle, Captain Grey, Stirling, Evans, Mann, Dresser.

Doing circuits, eights, vol-plane landings, etc.: alone: With John Drew and Anstey Chave:—Camberbirch, Arnsby, Wooley, Ormerod, Smith, Millburn, Chapman, Neal, Rochford, Thom, Roberts, Rayne, Ackroyd, Collins, Ridley and Lieut. Cooke.

A very good Royal Aero Club Certificate was taken by Captain Grey in a nasty bumpy wind on the 10th inst.

Machines in use Hall and Caudron Government-type tractors.

PATENT INFORMATION

This list is specially compiled for AERONAUTICS by Messrs. Rayner and Co., Regd. Patent Agents, of 5, Chancery Lane, London, from whom all information relating to Patents, Designs, Trade Marks, etc., can be obtained gratuitously.

APPLICATIONS FOR PATENTS.

- 17,436-7 Alexander Albert Holle, Arthur William Judge, and Varioplane Co., Ltd. Aeroplanes. 13/12/15.
- 17,486 Samuel Edgar Saunders. Seaplanes. 14/12/15.
- 17,505 George William Cooper. Aerial machine of the heavier-than-air type. 14/12/15.
- 17,528 Hugh Oswald Short. Mounting guns on aeroplanes, flying machines, and other aircraft. 15/12/15.
- 17,723 Frederick Handley Page. Flying machines, and the like. 18/12/15.
- 17,766 Austin Cairns. Propellers for aerial machines. 20/12/15.
- 17,820 Elizabeth Anne Clark. Balloons and the like. 20/12/15.
- 17,850 Pietro Carcano. Aeroplanes. 21/12/15.
- 17,966 William Twining-Weight. Braking-appliance for aircraft. 23/12/15.

SPECIFICATIONS ACCEPTED

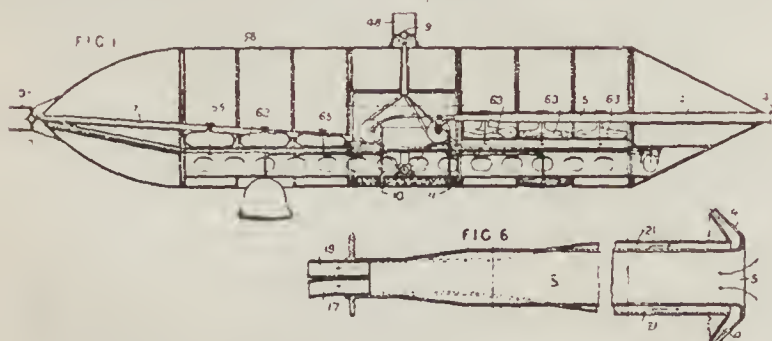
- 616 Gray and Best. Searchlights.
- 24,084 Gillett. Aeroplanes, hydroplanes, and the like.
- 1,803 Westwood and Player. Ties for aeroplanes.

SPECIFICATIONS PUBLISHED.

- 12,574 Bell. Aerial machines.
- 24,084 Gillett (Constantaras). Aeroplanes, hydroplanes, and the like.
- 1,803 Westwood and Player. Ties for aeroplanes.

LATEST PUBLISHED ABSTRACT

- 18,935 "Aeronautics." H. C. Berry, 409, Stimson Building, Los Angeles, California, U.S.A. In order to diminish the head resistance of an airship and to aid in its propulsion



sion rotary blowers are arranged to draw in air through the forward end of a pipe 5 and to discharge it around the end of the aerostat through a nozzle 4 surrounding

the front end of the pipe 5. An air jet 7 may be arranged at the rear of the aerostat, and jets 9, 10, 11, may be arranged above and below for controlling the altitude of the airship. The air from the tube 5 passes along tubes 17, 19, to the inlets 16 of the rotary blowers. The pipes 7, 9 discharge into open box-like casings 35, 48, which are mounted on universal joints and maintained in the normal position by springs.

Printed copies of the Published and accepted Specifications can be obtained from Messrs. Rayner and Co. at the price of 1s. each.

WILLS AND BEQUESTS

Second Lieut. William Middleton Wallace, 5th Battn. Rifle Brigade, attached Royal Flying Corps, of Edinburgh, a fine Rugby footballer, played for Scotland against England in 1913 and 1914, and against Wales and Ireland in 1914, killed near Saingham, £175.

AIR-RAID BANKRUPTCY

Examined in bankruptcy at Warrington, Lancs., Mr. A. McLeod Loader, theatrical manager, author, and producer of plays, said that he was the manager of the Aldwych Theatre, London, from July, 1913, to January, 1915, at a salary of £12 a week, in addition to £6 a week as manager of theatres at Warrington and St. Helens. Sir Joseph Beecham was the owner of all three houses. Mr. Loader said his deficiency was £2,859, and explained that he lost heavily through air raids on towns where his companies were performing. The examination was closed.

L. BLERIOT (Aeronautics)

SIR,—As general manager of the English business of L. Blériot (Aeronautics), I have been asked whether this business is in any way affected by the winding-up petition which has lately been filed against the Blériot Manufacturing Aircraft Co., Ltd. I should like an opportunity of explaining that the business of L. Blériot (Aeronautics) is in no way affected by the petition filed against the Aircraft Co. Some time ago M. Blériot entered into a contract for the transfer of his business to the company, but the business has not, in fact, been transferred. M. Blériot has what he considers to be very good and sufficient reasons for declining to make this transfer to the new company, but owing to certain litigation which is pending I am at present precluded from discussing these reasons in the public Press. Meantime, the business belongs entirely to M. L. Blériot. It is being conducted by me on his behalf, and is solely employed on Government service.

NORBERT CHEREAU.

January 6, 1916.

BLERIOT MANUFACTURING AIRCRAFT CO., LTD.

SIR,—I crave your permission to enable me through your columns to ask all shareholders in the above company to abstain from signing any proxy forms that may have been sent to them by the secretary of the company or by the Duke of Manchester to be used at a meeting that has been convened for Thursday next.

A committee of shareholders has been formed, with the Earl of Mexborough as chairman, and of which I am secretary, to support a petition to wind up the company, which will be heard in the High Court on Tuesday, the 18th inst.

A circular has just been issued by the company to the shareholders, to which I am about to issue an answer, and I strongly advise any shareholder who has already sent a proxy to write and cancel it and to attend the meeting in person.—Yours, etc.,

B. BAINES (Solicitor).

17, Green Street, Leicester Square, W.C.

THE GREEN ENGINE COMPANY

We are informed by the Green Engine Company that a rumour having been given currency that the company has been taken over by an aeroplane construction company, this rumour is entirely without foundation. We are glad to be able to publish this refutation; the more so since the Green is the oldest English aero engine, which has ever since its creation brilliantly upheld its prestige, and in view of the fact that Fred Ray, the managing director, at whose request this notice (except for the laudatory portion) is published, is one of the best known and liked personalities in the aviation industry.

BOOK RECEIVED

"AEROPLANES AND AIRSHIPS." W. E. Dommett. London: Whittaker and Co., 1915. 106 pp., illustrations and figures. Price 1s. net.

COMPANY NEWS

Kyl Fyre, Ltd.—Alex. Nisbet, 3, Lincoln's Inn Fields, W.C., appointed joint liquidator December 13.

The Mayro-Wing Aviation Co. (James Mayrow, trading as), 82a, Lillie Road, Fulham, S.W.—First meeting, January 10, and public examination February 10, at Bankruptcy Buildings, Carey Street, W.C.

AERONAUTICS

A WEEKLY JOURNAL DEVOTED TO THE TECHNIQUE OF AERONAUTICS

(FOUNDED 1907)

Edited by JOHN H. LEDEBOER, B.A., A.F.Ae.S.

VOL. X. No. 118 (NEW SERIES)

JANUARY 19, 1916

[Registered at the G.P.O.]
as a Newspaper

ONE PENNY

THE LIGHTS O' LONDON

FOR years past we have urged in these columns and elsewhere the pressing need for the adequate representation in the House of Commons of the interests of aviation in general, and more particularly as forming a vital element in the whole scheme of national defence. There have been what may be described as "lay" members who have done their best in the past to watch and uphold the claims of aviation and to transform official apathy into activity; but owing to one cause or another their efforts have been largely without avail. Perhaps the chief reason for their ill success is to be sought for in the fact that the advocates in question possessed only a vicarious interest in their subject and in no case—save that of Mr. Winston Churchill—any first-hand knowledge thereof. To this state of affairs we may well contrast the conditions prevailing in France, where several members of the Legislature—such as Senator Reymond and Deputy Girod—are aeroplane pilots, and some of them serving with the Forces. A similar innovation could not fail to be attended with good results in this country. Anxious as we are to see aviation represented in Parliament, we are unable to endorse the candidature of Mr. N. P. Billing for the Mile End Division of London. True, Mr. Billing holds a pilot's certificate, which he obtained one morning as the result of a bet; but in no other sense can he be said to be a practical aviator. Again, his experience as a manufacturer can hardly be described as wholly successful. His services at the Admiralty may have been of the most valuable nature—no information is available for publication on this point—until his recent retirement. But these are not qualifications that entitle Mr. Billing to speak for aviation as its Parliamentary representative. Even apart from this, we dissent most strongly from his expressed views regarding Zeppelin raids and the air defence of London, and would be unable to support his candidature on this ground alone. It may be possible that, as one laudatory scribe has it, "Mr Billing dislikes anything savouring of showmanship," but one cannot help feeling that, having regard to all the circumstances of the case, the lime-light operator is doing his best just now.

With one part, and one part alone, of Mr. Billing's election programme are we concerned, and that is his advocacy of radical alterations in the present system of the aerial defence of London. Why in this connection London alone should be mentioned—whereas, as we have repeatedly shown, the real air

defence of London begins on the coast-line (or even beyond), while it may be presumed until the contrary is proved that the life and property of the average inhabitant of Newcastle or Sheffield or Hull are of at least equal value to those of the average Londoner—is not clear, save as an electioneering tag likely to appeal to the mass of electors. So far as we can make out, Mr. Billing, in the aeronautical portion of his manifesto and in his articles, which have lately fallen as thickly as leaves in Vallombrosa, makes three definite points. First, that the organised darkening of the streets of London is unjustified and unnecessary, since darkened London viewed "in silhouette" (whatever that may mean) offers a better target for accurate bomb-dropping to the Zeppelin Hun, than a city with all its lights ablaze.

Second contention: the very act of dowsing our lights creates the impression among the Huns and among the dear neutrals of our being panic-stricken, and therefore amounts to a confession of failure on our part. Thirdly, we are not to rely for our means of defence upon anti-aircraft guns but upon aeroplanes. Let us examine Mr. Billing's points seriatim, remembering the while that although, according to his own asseveration, he may have worked out a complete scheme for the air defence of London down to "the minutest details," Sir Percy Scott has earned a world-wide reputation as a gunnery expert, while Mr. Billing's success in this direction has not been quite so striking.

Point one. For obvious reasons no personal evidence can be adduced. It can only be stated—and stated in the most emphatic and specific terms—that Mr. Billing's expressed views in this connection are not only directly at variance with those of the men responsible for the initiation and enforcement of London's lighting regulations—and the people in question are officers in His Majesty's service and real flying men in practice, whose mouths must perforce remain closed—but obviously opposed to the dictates of the baldest common-sense. Let it be stated here once and for all, so that the statement may be on record, that the restricted lighting of London—and I am speaking from personal knowledge—has served and is serving its purpose. Save on a bright moonlit night London—although it can, of course, always be located in the broad geographical sense—has been rendered visually indeterminate. More than that it were unwise to say. Point number one.

After all, when all is said and done, London as a corporate body and as a conglomeration of individual citizens, is not a whit less patriotic than the other localities of the United Kingdom and Ireland. Londoners, in fact, will gladly put up with the slight inconvenience of darkened lights if this serves the purpose of the nation. All this talk of panic among the population in regard to Zeppelin attacks is the merest moonshine; on the contrary, experience of past raids has proven that the public rather enjoys them as a novel spectacle. Many people, in fact, have purposely stayed in London overnight when the weather seemed propitious for raiding, in order to be privileged to witness the display. And this in no spirit of levity; on the contrary, we all deplore the loss of life and the suffering entailed among the victims; but viewed from the proper perspective of a great war, the results attained by the Germans, regarded as a whole, are so ludicrously incommensurate with the money and effort expended in achieving them, and fall so immeasurably short of the hopes entertained by them a year ago, that we are justified in regarding the matter with supreme unconcern.

There remains the third point, that the system of defence hitherto adopted is based on the wrong methods, in that it relies too exclusively upon anti-aircraft guns and neglects in too great a measure the employment of aeroplanes as Zeppelin destroyers. The inevitable analogy of Paris is here again adduced. Now, as we have repeatedly pointed out in the past, there exists in fact no analogy between the cases of London and Paris. That the French capital lies only some sixty miles behind the battle-front is beside the point, for it is at least as far distant from the great German airship bases (which is the only material consideration) as London. The reasons for the comparative immunity of Paris from German aircraft depredations as compared with London have already been explained. They are twofold: firstly, political and in the next case based on the fact that Paris is a vast entrenched camp, by this time probably extending right up to the fighting lines, strongly fortified and heavily armed; while London is an open town occupying an immense unprotected area, whatever special anti-aircraft armament may have been installed since the war. The point requires no further elaborating, being self-evident to any thinking person.

With regard to the employment of aeroplanes, it is certainly true that some months ago the French authorities inaugurated a nightly patrol by aeroplanes provided with searchlights above the capital. No doubt the spectacle of these night birds proved a mighty comfort to M. Durand and Mme. Dupont and the rest of the "brave bourgeoisie" and lulled them into a sense of security; but it still remains to be proved that it has played the slightest part in causing a cessation of the raids.

Were these to take place during the hours of daylight the case might be different, but save over the remote reaches of the North Sea and the Baltic no Zeppelin has ventured to expose its nose to the light of day. Now, aeroplane flying at night is an excessively dangerous undertaking; it has already cost us the loss of several valuable lives, while its results are bound, owing to special difficulties, to be meagre in

the extreme. No one doubts that our pilots and observers would cheerfully face the risk; they have already done so repeatedly. The point is—and the authorities with the special knowledge at their disposal are alone competent to settle it—whether the results obtainable justify the taking of the risk. Let us remember that no aeroplane has ever yet come within measurable distance of a Zeppelin during the hours of darkness, and that, according to the official reports, which there is every reason to believe to have been perfectly accurate, only one pilot hitherto has even caught a fleeting glimpse of these craft.

It was stated above that the air defence of London begins on the coastline and even beyond. The statement is strictly correct. During the past, many an encounter between our warships and hostile airships has occurred in the North Sea and passed unchronicled. It is not too much to say that London's recent immunity from attack, and, no doubt, the prevention of many a Zeppelin raid, have been due, first and foremost, to the efforts and vigilance of the Navy and the coast patrol. If once we lost the command of the sea our first and most effective means of defence against airship attack would vanish for ever. Time and again the approach of enemy aircraft (which are bound to emerge over the North Sea in the hours of daylight when outward bound for our shores) has been reported by our warships and their movements duly chronicled. Time and again their scouting operations have been checkmated by our fire. One remembers Kipling's description of the submarine emerging on the surface of the sea and catching sight of a hovering Zeppelin—

"With its shining big belly half blocking the sky."

It is for this reason alone, the fact that our anti-aircraft defence is entrusted in the first place to the Navy, that we are inclined to deplore the recent transference of the aerial defence of London from the Admiralty to the War Office. Division of control and direction must perforce make for inefficiency. In any case, it is to be devoutly trusted that no outside influences will be allowed to interfere in the matter, since it is one for the authorities alone. If it can be shown conclusively that the measures at present taken for the defence of London are ineffective in the light of our present knowledge or inadequate, we shall be the first to condemn them. But hitherto such proof is lacking and arguments to the contrary are specious and inconclusive. The submarine campaign found us equally unprepared; but before many months had elapsed we found the means to deal with it effectually. So in this case.

One more point. We are a maritime nation; for the safety of these islands we rely to-day, as we have always done, upon the activity and superior fighting power of our far-flung fleet, instead of depending upon coastal batteries. If in this case, too, we are to be successful let us place our faith in the fleet, and upon such other and subsidiary methods of defence as the air services, with the unlimited wealth of knowledge and experience at their command, may undertake. Above all, we strongly deprecate any panic-mongering.

J. H. L.

A HYDROGEN PLANT FOR THE AMERICAN NAVY

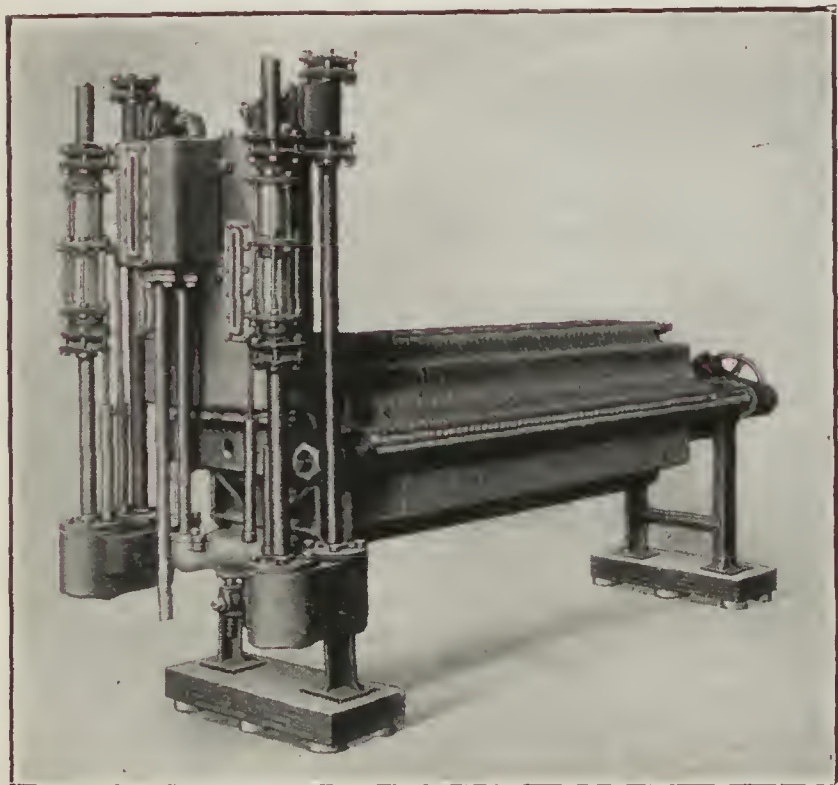
THE demand for oxygen and hydrogen for various industrial uses has grown very rapidly in the last five years. Certain lines of manufacture have been built up largely through the oxygen process of welding, while the use of oxy-welding for repairing broken machinery is now indispensable. Hydrogen likewise is in active demand; it is used more and more for cutting purposes and for light welding. This rapid development in the uses of two gases was facilitated by the introduction into this country of oxygen and hydrogen generating apparatus several years ago. Large users of one or both of these gases were thus enabled to obtain their supply direct from their own generating plant at low cost, in a manner suitable to their individual requirements.

In the field of oxygen and hydrogen generating equipment the International Oxygen Company, of New York, from the beginning set a high standard.

The present type, the I.O.C. Bipolar Generator, resembles outwardly a filter press, such as used in many chemical industries. Moritz, of Wasquehal, France, patented this type of apparatus in the U.S. and elsewhere, and I. H. Levin, of the International Oxygen Company, who studied under Moritz and Flamand, perfected this machine, and incorporated in it many novel and ingenious features. The machine which is built at present by the I.O. Company is as different and as superior to the old Moritz machine as the I.O.C. unit type cell is superior to the method of making oxygen and hydrogen in college laboratories.

General Description

Briefly described, the I.O.C. Bipolar Generator consists of a series of metallic plates (electrodes) clamped up together in a heavy frame, electrically insulated from one another and separated by diaphragms of porous fabric.



THE I.O.C. BIPOLAR OXYGEN AND HYDROGEN GENERATOR TYPE G

Each pair of these electrodes forms a closed cell divided by the diaphragm. These cells are filled with the electrolyte (caustic potash or soda), which acts as a conductor.

An electric current admitted at one end plate passes on through the plates and the solution to the other end plate. In its passage it decomposes the water in the solution into the two gases—oxygen and hydrogen—which are released on opposite sides of each plate and emerge upward into the gas off-takes. The mingling of the oxygen and hydrogen in each cell or compartment is prevented by the diaphragm,

which, while permitting the passage of the fluid, resists the passage of the gases, according to a well-known physical law.

As the gases are released and withdrawn the solution is automatically replenished from a supply tank. The operation is continuous so long as current and electrolyte are supplied.

The Frame

In the smaller machines the electrodes are carried on two steel rods supported on two heavy end pieces or pedestals of cast iron. In the larger generator the side rods are replaced by steel bars. The construction is one of extreme rigidity, absolutely proof against any distortion and consequent disarrangement of electrodes with resultant leakage. It will be noted that there are only the two end supports—no middle support, as in some types—simplifying the problem of erection and alignment.

The electrodes are clamped together by a heavy screw working in the rear support. A feature of special note in the I.O.C. Generator is that a ball thrust bearing is interposed between the end of the clamping screw and the rear end plate—a refinement not formed in other types, but contributing to the non-leaking qualities of the machine by doing away with the tendency of the electrodes to “ride up” from the side bars under screw pressure.

The Electrodes

These are of a special design covered by a patent of this company—the anode side being heavily nickelled, while the cathode side is of commercially pure iron. This use of two metals has an important bearing upon the efficiency of the generator, referred to more fully later. The surfaces of the electrodes carry vertical corrugations which are interrupted by a large number of depressions to facilitate the flow of electrolyte into the cell and the release of the gases from it.

At top and bottom of each electrode are two openings communicating by a cored channel with opposite sides of the plate. Those at the bottom are for the water intake and those at the top are for the gas offtake. It will be seen that each half of each cell (separated by the diaphragm) has its own independent water intake and gas outlet, so that there can be no possibility of the two gases mingling through these channels. Any gas leakage which may occur between the electrodes escapes to the open air, and not into the adjacent cell or into the gas offtakes.

The Diaphragms

These are of especially prepared asbestos fabric, of a thickness and texture carefully worked out by long experiment to give the best results. All around the edge of this fabric is moulded a packing rim of pure rubber which rests in a recessed groove on the face of the electrode.

Internal Insulation

Obviously, in a generator of this kind, an essential of power economy is that all the current supplied the machine shall pass through the electrolyte and none of it be by-passed through the metal of the machine or through the water inlets and gas outlets.

In the I.O.C. Bipolar Generator the electrodes are insulated from the side bars of the frames by porcelain insulators resting on a wooden bar in the large machine and on fibre in the small machine. They are insulated from one another—first, by the pure rubber packing rim surrounding the diaphragm; second, by nipples of pure rubber inserted in the water intake and gas offtake shoulders of the electrodes—these nipples, with everything clamped home, meeting one another and not only insulating the electrode shoulders, but also providing an insulating tube in the interior of the water intakes and gas offtakes.

External Insulation

The gases rising from the electrodes and entering the gas offtakes carry with them a small percentage of the elec-

trolyte, which, if allowed to enter the external piping system, would "ground" the apparatus and permit the escape of current.

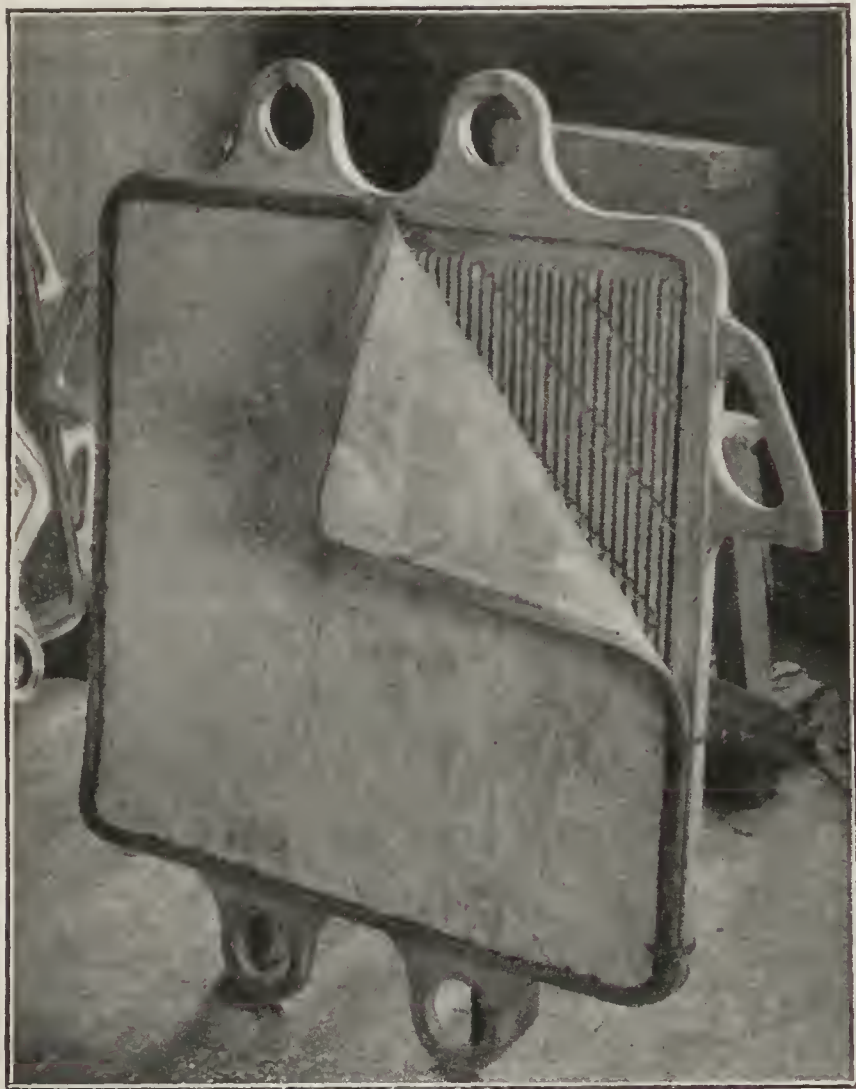


PLATE WITH DIAPHRAGM

To guard against this contingency there are provided in the gas offtake system insulating pipe sections, each consisting of two sections of heavy glass tube clamped between iron flanges and so devised as to intercept and drain off through an insulating connection the moisture entrained in the gases. The gases go through these insulators substantially dry and free from electrolyte.

Electrical Efficiency

The voltage supplied to any electrolytic gas generator is utilised in two ways—partly in decomposing the electrolyte and partly in overcoming the internal resistance of the generator. Electrical efficiency depends upon the minimising of the decomposition voltage and the minimising of the voltage overcome in ohmic resistance.

A number of features of the I.O.C. Generator contribute towards high electrical efficiency. First of these is the use of the nickel anode and iron cathode (a patented combination), which has been found to facilitate materially the electrolysis or decomposition, and to lower the over-voltage. Incidentally, these bi-metallic electrodes prevent the formation of rust and oxides which would materially shorten the life of the apparatus.

A second feature in efficiency is the fact that the design of this generator is such as to retain within the apparatus most of the heat produced as a result of the ohmic resistance. This keeps the electrolyte and the electrodes at a comparatively high temperature, which adds to the efficiency of the electrolytic process. Furthermore, the electrolyte used—a solution of caustic potash—has been found by experiment to utilise the current to best advantage.

Water Feed

The generator is filled, on starting the apparatus, with the solution constituting the electrolyte. Obviously, as

decomposition proceeds and gases are withdrawn, water must be supplied to the solution to maintain the right level and right density.

On the front of the generator are two tanks or domes with glass water level indicators, which carry the solution. Pipes descend from these tanks to a water-feed manifold which branches into two pipes connecting independently to the two water intakes to the cells, and also into two risers leading to the two independent gas domes above. Into those domes the oxygen and hydrogen are separately discharged as generated, the gas offtakes opening through an inverted "U" below the fluid level.

Next to these domes is a feed-water tank discharging distilled water through a float-controlled valve, as needed, to the solution tank on the front of the generator.

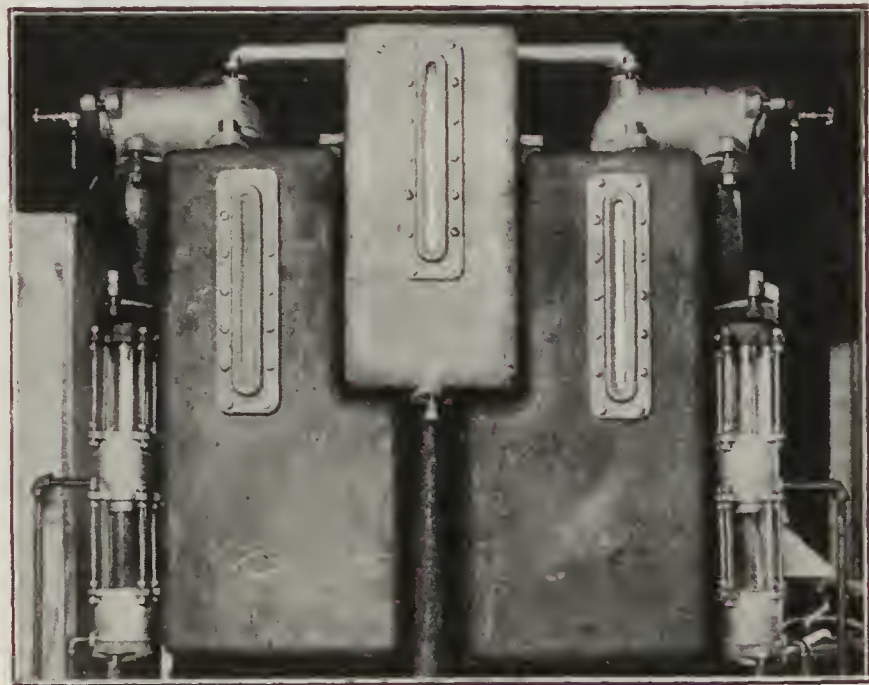
Arrangements are such that the proper fluid level is automatically maintained throughout the system. The two independent water intakes to either side of each electrode absolutely prevent any mingling of oxygen and hydrogen through the water supply.

This water-feed device creates an absolute balance of pressures throughout the generator, the vital importance of which will now be noted. Furthermore, it makes the water feed absolutely proportioned to, and under the control of, the rate of gas generation.

Control of Water Pressure

A primary essential in a generator of this type is to minimise circulation through the diaphragms—the function of these diaphragms being only to segregate the two gases as released, at the same time permitting the passage of the electrolyte through their pores.

The two independent water supplies—one to either side of each diaphragm, but both under exactly the same pressure, due to the hydrostatic head in the solution tank—obviously put the diaphragms under balanced fluid pressure and eliminate circulation through them due to unequal pressures on their two sides.



SHOWING DOMES AND WATER CONTAINERS WITH GAUGES AND INSULATORS

This has two vital results. First, it removes any tendency to cause a mingling of gases through the diaphragm. Second, it relieves the diaphragm material from all mechanical stress and obviates any destructive erosive action which might be caused by solid particles in the electrolyte being forced through the fabric. This absolute balance and control of water pressure then affects both the purity of the gases and the life of the apparatus.

Control of Gas Pressure

The two gas offtakes discharge into the two independent gas domes already referred to, the gas emerging below the

fluid surface through an inverted "U." It is apparent, then, that the pressure on both gases, clear back to the individual cells, is the same—being that determined by the hydrostatic head in the domes through the two independent risers from the water-feed manifold.

This balanced pressure in both gas-offtakes forbids any mixture of the gases and contributes to the balancing of pressures on the diaphragms. It will be noted that gas and water pressures are predetermined and constant.

Purgers

The gases, escaping from the gas-offtakes, rise through the fluid in the gas domes and pass out through discharge pipes at the top of the domes—thence downward to purgers in either side. These purgers are closed boxes of cast iron filled with water to a certain level. The gases, except below the surface of this water, pass upward through it, and emerge thence through the supply lines to the gasholders.

The function of these purgers is three-fold: first, to catch any entrained fluid in the gas; second, to cool the gas; third, to act as a water-check-valve protecting the pressure system of the generator from any undue pressure of the gasholders.

Safety and Indicating Devices

A signal whistle is provided which gives notice when the level of the solution in the generator falls below the described limit. Glass sight-feed indicators on the solution tank and gas domes show the fluid levels and reveal the generation of the gases. Gauge glasses connecting with the electrodes at intervals along the generator show the fluid levels in the body of the apparatus.

Drain Valves

To permit the emptying of solution from the generator when required, drain valves are provided. These are of the lever-operated gate type, designed to obviate any leakage or wear due to the presence of solid matter in the fluid.

As will be seen from the above description, the I.O.C. Bipolar Generator is a complete machine, perfectly adapted to the ends sought. An ideal type of electrolytic generator must combine (a) electrical efficiency, (b) continuity of operation, (c) purity of the gases produced, (d) highest degree of safety, (e) correct design, ensuring long life and little, if any, maintenance cost. The I.O.C. Bipolar embodies these requirements completely. The machine is designed for steady and continuous work and for great durability.

The quality of the materials used in the machine is perfectly suited to all the physical and chemical strains for which the machine is designed, even under severe conditions of overload. The diaphragms separating the gases are made of the same high grade of special material as those that have been giving satisfactory results in the unit type generator of the I.O.C. system. The surfaces of the electrodes are specially treated, with the result that efficiency of the apparatus is extremely high. In addition, this patented treatment of the electrodes prevents the formation of rust and oxides, and thus appreciably lengthens the life of the apparatus. The rubber used in the generator is the only material that is subject to deterioration, and may require replacing.

To summarise, the notable features of the machine are:

1. The water feed to the generator is automatic and controlled entirely by the quantity of gas that the generator makes.
2. The water feed to the oxygen and hydrogen compartments are entirely independent, preventing mechanical transportation of the gases from one compartment to the other.
3. The surfaces of the electrodes are especially treated, which gives them long life and high efficiency. The use of a nickelled anode and an iron cathode are exclusive patented features of the I.O.C. system.
4. The gas-offtake devices are independent and isolated one from the other, so that any leak of one gas would escape in the open air without being able to enter the other gas main.
5. The circulation of the solution in the apparatus has been reduced to a minimum, so that the wear and tear on the diaphragm caused by rapid circulation in other types of filter-press generators is entirely avoided in the I.O.C. design.
6. An audible signal will warn the operator should the electrolyte in the apparatus get lower than the prescribed height.
7. Each generator is supplied with purgers which automatically free the gas from water and caustic that it might contain.
8. Each generator is provided with insulators of an improved design, eliminating all rubber tubing insulation, which is unsatisfactory because of the attack of the gas as well as from carrying current.
9. The mechanical features of the machine and workmanlike design give the machine extreme ruggedness and a degree of permanence that will permit the machine to give good service for many years.
10. The materials used in the machine are eminently appropriate for all the chemical and electrical strain the machine must undergo, preventing corrosion or replacement of parts.
11. The purity is very high, oxygen being 99.6 per cent. or better, and hydrogen 99.8 per cent. or better.
12. The efficiency of the machine is high, giving 4 ft. of oxygen and 8 ft. of hydrogen per k.w.h.

Attendance

The I.O.C. Bipolar Generator has been developed to a point where it is as completely automatic as a high-duty device can be made. Practically the only attention required in operation is a maintenance of the water supply.

It is not to be inferred from this that the company recommends that these machines be started and then left absolutely to themselves. No mechanism is perfect, and the best apparatus made deserves a fair measure of consideration and attention. But the I.O.C. Bipolar Generator certainly calls for the minimum of attendance—at the most only a small part of one man's time. And this feature contributes largely to the low cost of gas production to be realised by this apparatus.

THE NEW F.I.M.A. MOTOR

THE Italian aero motor industry has lately had a new accession to its ranks in the shape of the 100 h.p. F.I.M.A. rotary motor. The principal characteristic feature of this engine is that it is designed on the 6-cycle principle. The following is a description of the 6 cycles: (1) induction; (2) compression; (3) explosion; (4) expulsion of used gases; (5) scavenging with cold air; (6) expulsion of residuum. The idea underlying the latter 2 cycles is to obtain the best possible cooling in the cylinders and perfect scavenging, since it is a well-known fact that in 4-stroke internal combustion engines there always remains a certain proportion

of burnt gases which, mixing with the new charge, considerably reduce the effectiveness of the latter.

This new motor has 8 cylinders disposed radially with a bore of 128 mm. and a stroke of 180 mm. The efficiency of this engine is illustrated by the fact that, whereas the ordinary rotary motor consumes about 300 grammes of petrol per horse-per-hour, the present type consumes less than 230 grammes per horse-per-hour.

The cylinders are made of nickel steel, and the crank shaft, as well as the remaining working parts, are made of pure steel.

RANDOM REMARKS

XXXIII.—HOW TO "RUN" A PAPER By ARTHUR LAWRENCE

THE first thing, it might be thought, is to provide yourself with adequate cash or its equivalent. Yet this is not always done. I have known a man to start off with a penny weekly paper, the circulation of which he intended should be well over the million, with little more than five pounds, a bit of credit—and cheek. Such optimism as that commands one's respect. No one likes to throw any cold water upon him, and if it were done he is so hot with enthusiasm that the water would promptly condense; I have been through it myself. I mean that I have financed a paper. It's true I collected a few thousands within a few days of my initial determination to possess a weekly rag of my own, and the capital would have been sufficient for my intentions, but the "expert" lured me away from my plans. I had intended to launch a small fishing-smack, but my experts, assistants, and hangers-on hurriedly laid down the keel of a liner, and they all looked to me to live up to these larger ideas. It was the sort of semi-trade paper which could have been run by two men and a boy, provided that they really spent a bit of their time on the job. [If that is the way in which he thinks a trade paper is run, no wonder his career was a short, albeit a merry one.—THE EDITOR.] The staff numbered close on a score. In the publishing department, where Mr. A. found it necessary to pursue a ceaseless campaign, going forth on his quest in the morning and returning not in the evening, one had to employ a Mr. B. to watch Mr. A. and a Mr. C. to watch Mr. B. Then you had to take a hand in the sleuth-hound business yourself in order to minimise in some measure the collusion taking place between the three Jesuits.

Book-keeping is an essential part of owning a paper. The books have to be "opened." Many weeks are taken up in carrying out this formality, during which time such details as income and expenditure, copies sold, and many other small details are pencilled on odd bits of paper, which are carried about by the parties most concerned in deceiving themselves as to the true state of their own department of effort. After which, if the ledgers are full of blanks and the cash-book is quite inexplicable, you may look for the reason in the fact that everything has to be passed through the Journal. The rough day-book is not beyond the limits of my feeble intelligence, but the Journal became the haunting horror of my existence. I never quite understood whether it was a sieve or a sponge—i.e., whether the "passing through" was automatic or required manual pressure. It seemed to absorb the entire working day of the two worthies, whose one clear manifestation of simple arithmetic arose when their pay became due. I don't think anything ever passed through that Journal. The items stuck somewhere, and never got through to the clear light of day. In those heroic moments when I would insist upon knowing how I stood I would find that all the rest of the books were about three months in arrear. The only financial point which was ever allowed to emerge was the balance at the bank,

because you could ascertain that bit of information yourself. In moments of extreme curiosity it was my practice to drive round to the bank and have the cab wait for me, in case I felt faint when I came out. Generally one of the clerks was sitting on the pass-book, which he hoped to make up on the morrow, while you grinned at him horribly and said "mañana" at frequent intervals. Then you popped round to see the manager, and from him you would get what you wanted—right in the midriff.

So far as offices were concerned two or three small rooms would have sufficed, but the offices I found myself in would have allowed of our stabling a dozen horses without interfering with sleeping accommodation for the entire staff. The would-be owner of a paper is hereby warned that amongst other things he will need to be a chemical expert. This was revealed to me after we had gone to press with the first issue. I had selected what I understood to be the most reputable firm of paper merchants in the metropolis, and also that sort of paper which was the happy mean between the paper I should like to have used and the paper with which no printer could be expected to print. There was no sort of cousinship even between the sample deceitfully reposing on my roll-top desk and the stuff which did its best to run through the machines. The paper in bulk seemed to have been made out of china clay, metropolitan mud, and the firm's principles. Of course paper like that gives the printer full scope for his pleasures. Then when the paper had been brought up to sample the appearance of the journal suddenly became, if possible, worse than ever. Of course, it was the ink. I don't know whether I had been expected to go round to the printing works and lick up samples of ink before the printers got their old jammers going, but there was no doubt that something had been left out of that ink. "Now what," said my expert, who as usual was wise after the event, "now what is there lacking in that ink?" "Ink," I replied, and rushed away to solace myself with something which rhymes with that word.

No, running a paper is not like falling off a log. It is a combination of recondite trades. It brings you into contact with the most expert bluffers and the most highly trained thieves on the face of the earth. You are afraid to leave your bed in the morning and ashamed to go home at night. Hitherto you have believed everything you have been told, and that every man you meet toes the line of common honesty, an attitude of mind which, although cynics may smile, is not a bad working basis. But when you find yourself surrounded by expert publishers and advertising touts, you begin to wonder whenever you will get the mud off. No sooner has one Ananias cleared off for refreshment than another even more subtle beast takes his place. The only remedy is to put up the shutters. It requires a heroic effort to do this. You have shed so much of your own sweat and blood that you are loth to indulge in that running kick which will send the whole contraption to Jericho.

REVIEW OF AMERICAN AERO EVENTS IN 1915—(continued)

By E. LARUE JONES, American Editor

Exhibition Flying

Exhibition flying has continued throughout the past year, though not on the same scale as a few years ago. Looping-the-loop has become a requirement, and Art Smith inaugurated night flying and looping with an illuminated machine and using rockets attached to the trailing edge of the wings to scribe his performances on the blackness of the night.

Self-starters for engines have been adopted by several aeroplane manufacturers. One is made by N. A. Christensen and Co., and another, first installed by the Burgess Company, is that made by the Hartford Company, well known in the automobile trade.

Sportsmen Buy Flying Boats

The purchase of flying boats by sportsmen has developed some interesting types of floating sheds, which will be illustrated and described later in AERONAUTICS.

About a dozen or fifteen flying boats have been sold to sportsmen during the year. Vincent Astor and Harry Payne Whitney bought Burgess-Dunne water machines, and two others of like type have been ordered in Providence. The rest were mostly Curtiss flying boats. The Benoist Company sold several, while single sales were made by one or two other companies. The least said about home consumption the better.

Ballooning

Ballooning has, unfortunately, diminished in volume, and but one race has been held this year, and this attracted few entries and little attention. The Aero Club could give no figures on the volume of gas used nor the number of ascents. Prior to 1915 AERONAUTICS kept its own records. Some years ago, through the efforts of Leo Stevens and Captain Honeywell as manufacturers, considerable balloon-sailing was done, which greatly assisted in representation in the councils of the International Federation.

Insurance on aeroplanes in sheds can now be obtained, which is encouraging.

Aeronautics in the Army

In the Army, where aeronautics is confined to the Signal Corps, properly, the lack of men has been felt seriously. The law limits the detail of aviation students to such unmarried lieutenants of the line as are under 30 years of age. The Chief Signal Officer presents good reason why this restriction should be removed. This law makes eligible but 6.4 per cent. of first lieutenants, and but 34.4 of both first and second lieutenants. The age limit is also considered unnecessary, and another serious limitation is the proviso which requires the return to the line of the Army of an officer as soon as he reaches the grade of captain. The best men are being severed from connection with the aviation section under this latter rule. As a result of this there are but 2 officers of the regular Signal Corps, 20 junior military aviators, 4 qualified students awaiting rating, and 4 students, a total of 30 officers and 177 enlisted men. Of the enlisted men 9 have received instruction in flying and 20 have been rated as aviation mechanics.

The Signal Corps Aviation School has continued operations on North Island on San Diego Bay. The school is divided in two main departments—training and experimental and repair. The former is devoted to the training of student officers for junior military aviators, the instruction of enlisted men in flying, and the training of suitable enlisted men for aviation mechanics. The officers are given theoretical and practical courses in flying; in the construction, operation and repair of aeroplanes and motors; in meteorology and navigation of the air. Enlisted men on flying duty are instructed in flying and in the operation and care of aeroplanes and motors. Aviation mechanics are required to repair aeroplanes and motors by a thorough shop course. The personnel of the training course consists

of the officers assigned as instructors, two expert civilian instructors in flying, and an expert civilian instructor on motors.

Naturally the experimental and repair department conducts experiments, studies new types, repairs and reconstructs aeroplanes and motors.

Considerable time has been devoted to conducting tests of lubricating oils, testing and balancing propellers, and in special work with the tests of the Macy stabiliser. Experiments have been conducted in signalling from aeroplanes by means of Very pistols and smoke bombs, in the use of radiotelegraphy from aeroplanes, with the Broadwick parachute, in bomb-dropping with the Scott bomb-dropping sighting, timing and dropping machine, with types of aerophones and the location of submarine mines. Ten special type truck bodies have been designed and built in the shops. One of these is a completely equipped portable machine shop, with electric power for driving tools. The others are equipped with special bodies for carrying aeroplane spare parts, tools, crews, equipment, and reserve petrol and oil. A portable field-tent "hangar" has been designed and a number built by a local firm for the squadron.

The organisation and instruction of the personnel of the First Aero Squadron were completed during the year, and the squadrons sent to Fort Sill, Okla., for duty in connection with the problems of fire control and direction of the field artillery. The 439-miles flight from here to San Antonio at the conclusion of the season has already been recorded in AERONAUTICS.

During the fiscal year 3,458 flights of a total duration of 1,269 hours 50 minutes were made and 1,730 passengers carried.

The lack of a sufficient appropriation has greatly hampered the equipment and operation of the school and the squadron. More funds are urgently needed.

The War Department has directed the maintenance of an aviation school and a squadron for land flying in this country; the stationing of an aero company at Corregidor, P.I.; Fort Kamehameha, Hawaii; Canal Zone; and an increase later at Corregidor to a squadron.

Under this programme the Signal Corps Aviation School will continue at North Island until a permanent site has been obtained. The personnel for the company designated for Corregidor is now at the Aviation School, and its equipment is being purchased. It will leave for Manila at the close of the typhoon season. Steps are being taken to obtain the personnel and equipment, as far as possible with present funds, for the other stations. It is expected the company for Hawaii will go forward by next April.

The estimate for the present fiscal year is but \$1,358,000 (£271,000), on the basis of the programme prescribed by the War Department for utilising the personnel authorised by the Act of July 18, 1914.

The Chief Signal Officer states that one of the most serious technical problems that confront the aviation service is the development of a reliable motor. "Up to the present no American-built motors have proved entirely reliable for air service, nor do they equal in construction or performance those of foreign manufacture. It is proposed to develop a satisfactory type by a competition among the American motor manufacturers. For this purpose an item of \$50,000 (£10,000) has been included in the current estimates."

Energies have been directed to the establishment and equipment of the aviation centre at Fort Sam Houston, San Antonio, Tex. The personnel for this centre has been organised and trained, the aeroplanes purchased, and sheds which will accommodate ten machines are being provided. The necessary buildings are in course of erection and will be ready early in 1916.

The great need at this time, aside from sufficient appro-

priations, both in the Navy and the Army, is trained men for pilots and observers. A change in Army rules, as noted above, would help. As at the present time we could produce 100 machines a month from the various factories, and there is no doubt of the ability of manufacturers being able to arise to the occasion with a sufficiently large output, there is no worry on this score. The number of officers and men now authorised by law is inadequate to the needs of the Army as it is at present organised. With one aero squadron per division, the present organisation of the Army calls for five aero squadrons. The commissioned personnel provided by law allows a sufficient number of officers for three aero squadrons, while the enlisted strength is insufficient; and if the number of officers and men allowed by law should be organised into three aero squadrons there would be no personnel left for the conduct of the Aviation School.

The present war in Europe has developed three separate types of aeroplanes—the reconnaissance and fire-control machine, the combat machine, and the pursuit machine. The aviation section possesses a satisfactory type of reconnaissance and fire-control machine and has taken up the question of the development of both combat and pursuit types. For this purpose an item of \$50,000 (£10,000) has been included for experimental machines in this year's estimates.

It is suggested that a squadron of 12 machines should be the basis for our organisation, 8 of which would be of the reconnaissance type and 2 each of the pursuit and combat types. The present aero squadron has sufficient commissioned personnel for this increase in the number of machines (the present number being 8), but the enlisted personnel is deficient by 24 men to provide crews for the additional machines and drivers for the additional auto-trucks. In case the Army remains at its present authorised strength, the personnel of the aviation section should be increased, the Chief Signal Officer reports, by 46 officers and 410 men to give sufficient personnel to supply 5 aero squadrons and to maintain the Aviation School. It is pointed out that there is need for at least one squadron for reconnaissance work in each of the three Coast Artillery districts in this country, and that a sufficient number of aeroplanes should be provided for fire direction and control for the Field Artillery on the basis of one aeroplane per battery, with one in reserve, or, in round numbers, 6 aero squadrons for this arm. This calls for the addition of 9 squadrons to those above mentioned.

The total cost of equipment necessary for these organisations is as follows: 1 aero squadron for Corregidor, 1 for Hawaii, 1 for Canal Zone, 1 for each of the 3 Coast Artillery districts, 1 for each of the 7 tactical divisions, and 5 for the Field Artillery, will be \$4,284,000 (£857,000). This, it must be remembered, is only sufficient for times of peace.

As a step towards getting the number necessary to meet war conditions an aviation reserve corps of officers should be created along the same lines as that of the Medical Reserve Corps of the Army, says the report. There are very few skilful cross-country fliers among civilian pilots, but there is material among them that could be utilised at the outbreak of hostilities. Officers of this reserve corps would be given commissions as first lieutenants in the reserve corps, and they should agree to serve at least three weeks each year at an aviation station, and while so serving receive the pay and allowances of a first lieutenant.

National Advisory Committee for Aeronautics

The National Advisory Committee for Aeronautics has just submitted its first annual report to Congress. The members of this Committee were appointed by the President last April, pursuant to an Act of Congress; and its duties are to supervise and direct the scientific study of the problems of flight, with a view to their practical solution, and to determine the problems which should be experimentally attacked, and to discuss their solution and their application to practical questions.

The Act appropriated \$5,000 (£1,000) a year for 5 years.

For the first year the expenditures were \$3,938.94 (£788). The report states that it is apparent that there is a large amount of important work to be done to place aeronautics on a satisfactory foundation in this country; that competent engineers and limited facilities are already available, which can be employed by the Committee to advantage provided it has sufficient funds.

The Committee submitted a report of considerable value to aeronautics on the behaviour of aeroplanes in gusts, as determined by experiments and tests conducted by Naval Constructor J. C. Hunsaker and Prof. E. B. Wilson, of the Massachusetts Institute of Technology. The Committee interested the U.S. Rubber Co. in an investigation of balloon and aeroplane fabrics, and through the co-operation of the Navy Department extensive tests were conducted in the wind tunnel and experimental model basin at the Washington Navy Yard. This co-operation of the Navy Department with the rubber company yielded very desirable information for aeronautics in general, and shows strongly the advantage of some central authoritative body to co-ordinate the efforts of the Government departments and manufacturers interested in promoting the science of aeronautics.

Professor Charles E. Lucke, of Columbia University, was employed by the Committee to investigate and report on the thermo-dynamic efficiency of present types of internal combustion engines for aircraft. His report shows the practical development of the various types of aeronautic motors in use at the present time. (Reported in our issue of December 29, 1915.)

The John A. Roebling's Sons Co. contributed a report on wire terminals, their fastenings and connections. The "Relative Worth of Improvements on Fabrics" was the subject of a special report by the Goodyear Tyre and Rubber Co. The U.S. Bureau of Standards prepared a report on the Pitot tube and other forms of anemometers for aeroplanes. The U.S. Weather Bureau has taken up the problem of the relation of the atmosphere to aeronautics. All of the reports referred to were transmitted to Congress.

The Committee finds that one of its most important needs is the provision and equipment of a flying field, together with aeroplanes and suitable testing gear for determining the forces acting on full-sized machines in constrained and in free flight. The Committee's estimates for next year amount to \$85,000 (£17,000), which contemplate the purchase of proper equipment for the conduct of full-sized experiments and the development of the necessary technical and operating staff.

The members of the Committee are: Brig.-Gen. George P. Scriven, Chairman; Naval Constructor H. C. Richardson, Sec.; Prof. Joseph S. Ames; Capt. M. L. Bristol, U.S.N.; Prof. Wm. F. Durand; Prof. John F. Hayford; Prof. Charles F. Marvin; Hon. Byron R. Newton; Prof. M. I. Pupin; Lieut.-Col. Samuel Reber, U.S.A.; Dr. S. W. Stratton; Dr. Charles D. Walcott.

Further Activity

One of the notable articles published during the year was "The Story of Flight," a posthumous article by Wilbur Wright, which told for the first time many of the details of the Wrights' early experiments, which ran through several numbers of AERONAUTICS.

During the summer the Aeronautical Society of America held a "First Joint Conference on Aviation," attended by delegates from the Bureau of Standards, the Navy, and various technical schools and universities and engineering societies. A number of inventions were submitted and certain resolutions of a general technical nature were adopted as to these inventions.

The Aero Club of Pennsylvania has been very active during the year. There are some 82 clubs of record in America, including boys' model clubs. A bare half-dozen of these show activity, it is regrettable to state. The Pennsylvania Club has been able to secure the use of the League Island Navy Yard for their members owning flying boats. The Aero Club of America has raised a fund to aid organisations of the Naval Militia and National Guard.

The Aeronautical Engineers' Society was formed and limited to members of the Aeronautical Society of America, and is intended to be a purely technical organisation. Papers of value read before the Society are reviewed and printed from the Lee S. Burridge Fund left by the late President of the Aeronautical Society.

The Collier trophy for the greatest advance during each year has not as yet been awarded.

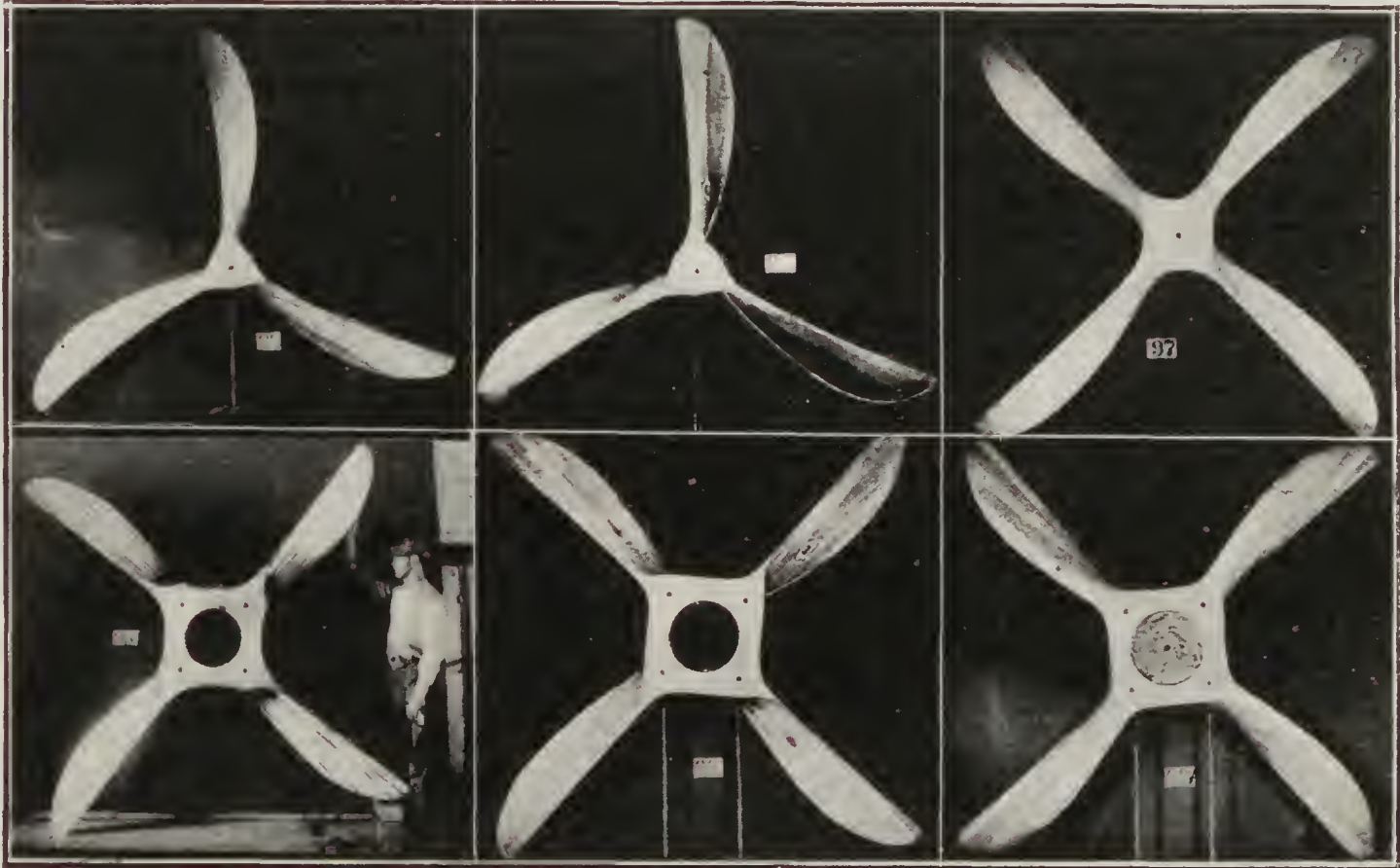
STEEL "PARAGON" PROPELLERS

THE American Propeller Co. will shortly announce the marketing of an all-steel propeller. This was patented some time ago, and a long series of experiments have been made, and now the perfect product is almost ready.

The photographs of recent construction are more or less

The idea advocated and urged by Rear-Admiral Peary is to divide the entire coast line from Eastport to the Rio Grande and from San Diego to Puget Sound into convenient sections or "beats," each beat in time of emergency to be patrolled continuously by a powerful hydro-aeroplane with a driver and observer, equipped with wireless apparatus. Such a machine driving along its section at a distance of 50 to 60 miles from the coast and an elevation of approximately 2,000 feet, can detect the approach of an enemy's ships from 50 to 60 miles farther at sea, and by means of the wireless apparatus convey the vital information as to their number, character and course to the shore stations, thus giving several hours advance notice to prepare for attack.

The efficiency of the aeroplane as a detector of submarines makes this aerial coast patrol a still more important factor in national defence.



A SET OF ~~STEEL~~ PARAGON PROPELLERS MADE BY THE AMERICAN PROPELLER CO.

novel. No. 88 shows one of the propellers used on the trial and acceptance flights of the Curtiss "Canada" Model "C" machine. These propellers are of quartered white oak. Nos. 85 and 97 are respectively three-bladed and four-bladed designs for the same machine; 85 has wider and thicker blades on account of the weakness of the mahogany material used. These propellers are nearly 8 ft. 6 in. diameter and nearly 7 ft. pitch. They turn at 1,400 to 1,500 r.p.m.

A more striking novelty is displayed by photographs 93, 96, and 96A. This is a 9 ft. 6 in. four-bladed propeller, with a pitch of nearly 10 ft. and a hub bore of nearly 14 in. It is to turn at 1,200 r.p.m., absorbing 240 h.p. The enormous centrifugal force of the blades created a grave problem in hub construction. One can discern from the photographs that each blade and its two adjacent hub portions are put together exactly like the three blades at the hub of a three-bladed propeller. This propeller was a beautiful piece of work; every piece of wood and every joint in it perfect, and weighs more than 100 lb.

MAINE'S AERIAL COAST PATROL

A MEETING of those interested in the establishment of an aerial coast patrol system along the shores of Maine has been held in Portland recently, and a definite organisation has been effected.

The first station, for the establishment of which the present movement is working, will probably be located in Upper Casco Bay. It will be the centre of a beat that will cover the coast from Kittery to Penobscot Bay. At least one other station to patrol the section from that point east will be required for the completed plan.

THOMAS NEWS

The first week in December witnessed much flying over Cayuga Lake and the surrounding territory. Two of the school machines were constantly in the air. The new pusher hydro-aeroplane built for the school has been completed and is undergoing the finishing touches.

Since Thanksgiving Day, William S. Brock has made many flights with the second Navy seaplane. During these flights the machine behaved admirably, showing many good qualities obtained by recent improvements made to this type. An unfortunate accident, however, on the eve of its acceptance trials resulted in the complete demolition of the aeroplane. After making an extended practice flight carrying the full load (including passenger, four hours' fuel, and useful load) while descending from an altitude of 2,000 ft., the machine came down with such speed and at so steep an angle that the pilot was unable to gain complete control in time to save the machine from plunging into the lake. Both passenger and pilot were immediately rescued from the wreck entirely unhurt and suffering only from shock.

The next of these seaplanes is being rapidly pushed to completion, and it is expected that it will undergo its acceptance tests within two weeks.

MODEL AEROPLANES—XXIII.

By F. J. CAMM

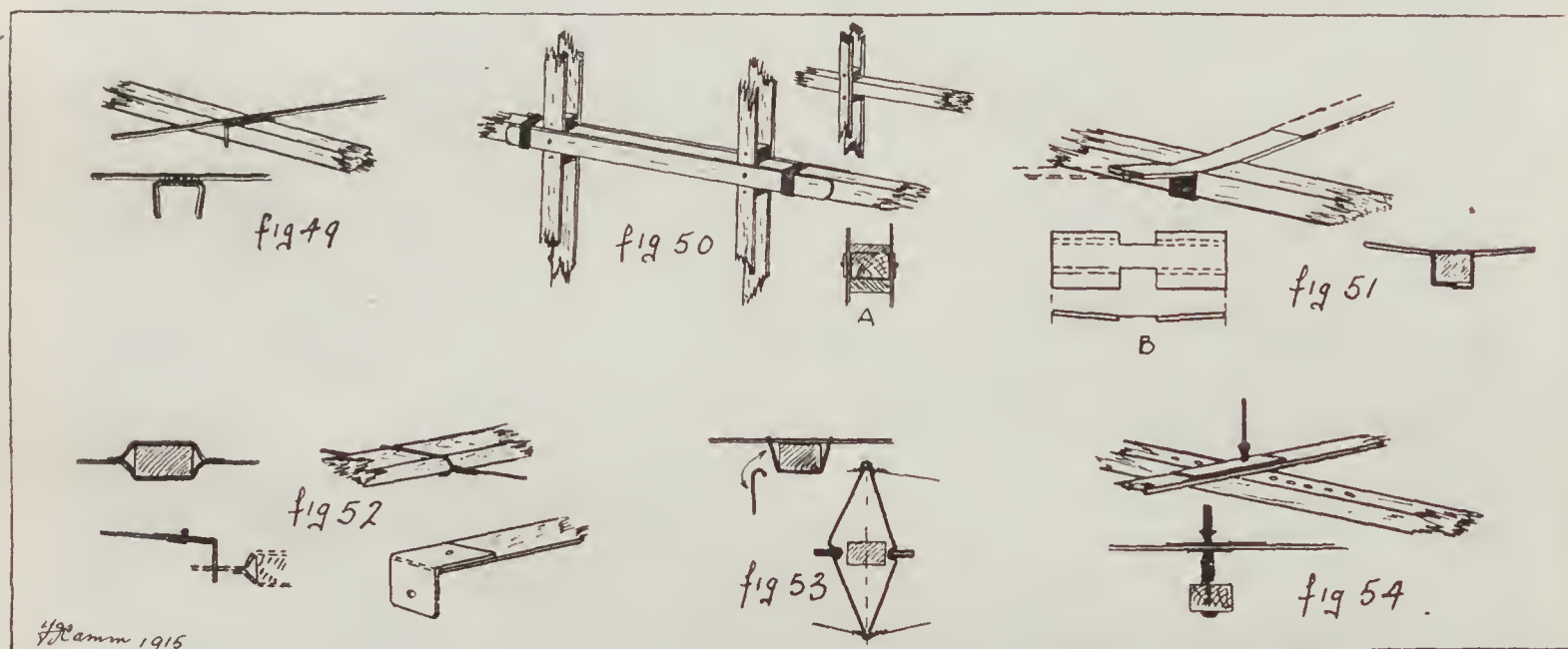
CONTINUING the description of main plane adjustments and means of varying the disposition of the centre of pressure in relation to the centre of gravity to obtain the essential coincidence of them, some further sketches are given this week of other well-known methods of so doing. Digressing for the moment, one recalls that in some of the earlier models that were successful in open competition—notably the Burge Webb models—this adjustment was effected by altering the disposition of a lead weight along a wooden rod suitably attached to the nose of the model.

Although this form of adjustment is suitable for flying—"scale" models, since by its use one can obtain the same relative position of the surface as in the model's prototype, it can hardly be advocated for ordinary flying models, as the desired result can be obtained by other methods for a much less expenditure of weight. But to continue: In Fig. 49 a simple main plane attachment for wire wings up

again tin clips are used; to the top of each is soldered a sheet tin socket of dimensions suitable to the spar it is to receive. The shape of the blank is drawn at B, which also illustrates, sectionally, the angle imparted to the projecting arms of the completed socket; the angle corresponds to the desired dihedral.

This fixture would only be necessary with a large model, where, for obvious reasons, it would be inadvisable to construct the main plane in one piece. If this latter is to be braced to a kingpost, then no further fastening would be required—otherwise the wing sockets and spars would have to be drilled to receive a pin, so that the planes remain square with the spar.

Fig. 52 is an alternative method. As shown, piano wire is shaped to fit over the longitudinal to provide extensions to engage with sockets fixed to the wing spar ends. It would be necessary with this fixture to brace the wings to obtain the dihedral angle, the tension of the bracing also



to 18 in. span is shown. Small clips of 18 s.w.g. piano wire, bent to resemble inverted U's, are bound and soldered to the wing spars. They must make a bare fit over the longeron, and the ends of them should be set in, as drawn in the lower sketch of this figure, so that the wing is held rigidly to it. This attachment is also suitable for tails; the surfaces are thus easily detachable.

Fig. 50 shows a method of adjusting superposed surfaces. The central inter-struts are attached to a horizontal rib—of birch for preference—one on each side of the motor spar, which extends over them, so that the tin sockets, which are shown black in the drawing, pass over these extensions and so facilitate adjustment. The position of the head and lower main planes with regard to the spar is maintained by means of wooden distance pieces, which are pinned and glued above and below the spar between the central struts, as shown in the sectional sketch A. In small biplanes the horizontal rib can be dispensed with, the friction of the distance pieces on the spar retaining the planes in position on it, but allowing them to slide backwards and forwards when it is necessary to alter their position. This attachment could, of course, be adapted to wire wings, where the inter-struts securing them to the spar are of wire. In place of the wooden distance pieces piano wire ones would be used, and replacing the horizontal rib would be four wire ribs—two on each side of the spar, similarly fixed by tin clips.

The subsequent figure indicates a method of fixing and adjusting a main plane that is built in two sections. Here

serving to bind the wings to their attachments. The sectional and perspective sketches will make the fitting quite clear.

Yet another wire main plane fastening is illustrated in Fig. 53. Wire crutches, the ends of which are hooked to clutch the wing spars, are shaped, as shown, to pass underneath the longeron. This method is suitable for models up to 30 in. span. The lower portion of Fig. 53 shows how to attach a kingpost so that it can be moved in conjunction with the main plane without interfering with the adjustment to the bracing. It will be seen that the kingpost is attached to two ribs affixed to the wing and running collateral with the longeron; it is cranked to spring over the ribs tightly.

Another means of varying the angle of incidence of the main surface of a model is drawn in Fig. 54. A piece of cycle spoke is threaded down to take the nipple shown in the drawing. This works upon a strip of tin pinned to the wing spar. Between the longeron and the bottom of the wing spar is placed a small steel spring which forces the wing up to the limits of the nipple. A series of 1-16th holes should be drilled in a portion of the spar—say, for two inches fore and aft of the c.g.—to make possible the variation of the position of the wing. It is the headed portion of the spoke that should be used. This device could only be used where the main plane is braced to the spar, since it would not in itself provide a rigid enough fixture to the spar.

(To be continued)

AIRCRAFT IN ACTION

OFFICIAL INFORMATION

ENGLAND

January 10—Hostile Air Raid—Hostile aircraft dropped bombs near Strazeele, Hazebrouck, and St. Omer. One woman and one child were killed.

January 13—The Work of the R.N.A.S. on the Belgian Coast—From Vice-Admiral Sir R. Bacon's despatch, dated December 3, dealing with the naval actions on the Belgian coast from October 18 to November 9, 1914: "Throughout these operations attacks have been made on our vessels by the enemy's aircraft, but latterly the vigilance of our Dunkirk Aerodrome, under Wing-Commander A. N. Longmore, has considerably curtailed their activity."

January 13—Four Machines Missing—"Four of our aeroplanes sent out yesterday (January 12) have not returned."

FRANCE

January 11—German Aeroplane Brought Down—During the course of yesterday, three aeroplanes, armed with guns, engaged, above the German lines near Dixmude, in a series of fights with enemy pursuing aeroplanes of the Fokker type. One of our aeroplanes, attacked by a Fokker, had to come to land, but the enemy aeroplane, assailed in its turn by one of ours, which fired grape-shot shells at a distance of about 25 yards, was brought down. The third French machine likewise attacked another Fokker, which fell in the Forest of Houthulst to the south-east of Dixmude.

(See German version)

January 12—Raid on Dunkirk—Two enemy aeroplanes dropped eight shells on Dunkirk, only causing insignificant material damage.

DARDANELLES

January 11—Aircraft Work in the Gallipoli Withdrawal—Aeroplane reports show that the naval fire on the left flank was most accurate, and it is probable that the enemy suffered considerably.

January 14—Attack on Monitor—Two Machines Brought Down—Turkish Official: "On January 12, one cruiser, nine torpedo-boats and one monitor opened an intermittent fire from outside the Straits on Tekke Burnu, Sedd-el-Bahr, and in the direction of Relidebahr (? Kilid Bahr). The monitor was attacked by one of our aviators, and was obliged to withdraw, enveloped in flames. On Wednesday afternoon, January 12, the pilot Boddicke shot down a fifth aeroplane near Sedd-el-Bahr. The pilot was killed and the observer wounded. Another Turkish aviator attacked an English aeroplane flying over Saros. The English machine was forced to descend on Imbros."

ITALY

January 12—Aerial Activity in the Trentino—Italian official: "On both sides there is great aerial activity. One of our air squadrons in a strong wind bombarded the enemy's aviation field at Gardolo to the north of Trent. On the way back it dropped bombs on the railway stations at Trent and Rovereto and the barracks near Volano. Enemy aviators threw bombs on several places in the Isonzo plain without doing any damage."

January 12—Activity of Italian Aircraft—On both sides aircraft have lately displayed considerable activity. One of our squadrons in unfavourable weather conditions and in spite of a high wind raided Gardolo to the north of Trent and bombarded the Austrian aerodrome in that locality. During the homeward journey the squadron dropped bombs on the railway stations at Trent and Rovereto and on a camp near Volano and safely returned to our lines. Enemy aeroplanes threw bombs on several places on the Isonzo plain without doing any damage.

January 13—More Italian Raids—Artillery activity assisted by aircraft continues along the whole front. On January 11 our aeroplanes dropped bombs on enemy encampments between Tiono and Brogezzo in Giudicaria valley, and returned safely to our lines.

January 15—Raid on the Isonzo Region—One of our air squadrons made an extended raid on the region east of the Isonzo, and bombarded the Aisowitz aerodrome and the military tenements at Chiavavano and Doruberg, and the railway stations of Lonatica, Pravecina, and Lubiana. The squadron, which was subjected to violent fire from numerous anti-aircraft guns, returned safely.

MESOPOTAMIA

January 11—Aeroplane Locates Turkish Force—A reconnaissance by aeroplane having located the Turkish force in position on both sides of the Tigris, near Sheikh Saad, a force under General Younghusband advanced up the Tigris, and established contact with the Turks on January 6, and held them to that position in obedience to orders received.

January 13—Reconnaissance Hampered by Storms—"A communiqué issued in Delhi describing the retirement on January 9 of the Turks from Sheikh Saad, 25 miles east of Kut-el-Amara, on the Tigris, states that reconnaissance by aeroplane was hampered by storms."

BALKANS

January 15—Bombs on Janes—French Official: "On January 14 the enemy aircraft dropped bombs on Janes, north-west of Kukus, and on Doganizi. Some Greek soldiers were wounded and one was killed."

GERMANY

January 10—Attack on Furnes—A German aeroplane squadron attacked the enemy warehouses in Furnes.

January 11—Two Enemy Machines Brought Down—A French aeroplane, armed with a 3.8 cm. gun, was compelled to land by our anti-aircraft fire, and a battleplane near Woumen, south of Dixmude. The machine was not damaged, and the occupants were uninjured. The battleplane and the men are in our hands. A British biplane was shot down in an air battle near Tournai.

[The following is a correct and literal translation of the French communiqué issued on January 11. In this connection it has to be admitted with regret that the gentleman in Renter's employ who has the task of translating these communiqués sadly bungles his job at times:—

"Yesterday three of our aeroplanes mounting guns fought a series of air battles above the German lines near Dixmude with hostile destroyer aeroplanes (avions de chasse) of the Fokker type. One of our machines, attacked by a Fokker, was compelled to land; but, on the other hand, an enemy aeroplane, attacked in its turn by one of our machines which fired shrapnel at it from a distance of 25 metres (80 feet), was shot down. The third French machine also attacked another Fokker, which fell in the forest of Houthulst, south-east of Dixmude."

The Fokker monoplane, one of which was recently exhibited at the Horse Guards in Whitehall, is simply a copy of the French Morane, and, to judge from the sample in question, an indifferent copy at that according to our standard of workmanship. In accordance with German practice, it has an all-steel framework, and is driven by an 80 h.p. Gnome, of German manufacture, known as the "Oberursel." Here be it noted in passing that the Gnome was originally evolved in Germany; subsequently the patents were exploited by the well-known French firm of Seguin, and shortly before the war the German patents were acquired by a German firm. Needless to say, the whole credit for the Gnome and its descendants belongs to the French. Fokker is a Dutchman established in Berlin, who some years ago produced an "automatic stability" monoplane, whose "automaticity" simply depended on a high centre of gravity and an exaggerated dihedral. He has as much claim to give his name to these Germanised Moranes as we should have to an Etrich. On the other hand it must be admitted that the so-called Fokker is exceptionally fast, a quick climber, and very handy to manoeuvre, while it usually mounts a couple of machine guns. It is designed solely and simply for purposes of attack.—ED.]

January 13—German Aviators Decorated—Lieutenants Boelke and Immelmann shot down two English aeroplanes, one north-east of Tourcoing and the other near Bapaume. In recognition of their extraordinary performance, these intrepid officers have been decorated by the Kaiser with the order Pour le Mérite. A third English aeroplane was shot down in an aerial fight near Roubaix, and a fourth by our anti-aircraft fire near Ligny, south-west of Lille. Six of the English aviators are dead and two are wounded."

January 15—Hostile Aeroplane Brought Down—A hostile aeroplane which Lieut. Boelke shot down north-east of Albert fell in the British lines and was set on fire by our artillery.

AUSTRIA

January 14—Italian Aerial Activity—The activity of the Italian aviators has extended to the sector of Trieste.

January 16—Bombs on Laibach—An enemy aviator flew over Laibach and dropped bombs. Nobody was hurt and no damage was done.

FROM OTHER SOURCES

FRANCE

January 9—Two French Aviators Killed—To-day was held at Chalons the funeral of two French aviators, Lieut. J. M. Landron and his observer, Captain P. C. de Maleville. They met their death during an air fight with two aviatiks on January 5.

Escapes of French Aviator—M. Henry de Pracomtal, son of the Marquis de Pracomtal, and an aviator since the beginning of the war, has just arrived in Paris, after endless adventures. Over a year ago he was wounded in the leg while flying, and was captured with his aeroplane and interned in Germany. He refused to give his parole, and after some months' imprisonment escaped, but was captured and locked up in solitary confinement in a fortress. He has at last regained his freedom by means which it is best not to publish. He tramped some 180 miles by night, hiding by day, and at last reached Swiss territory, whence he travelled to Paris.

January 11—Zeppelin Sheds Removed—The Dvinsk correspondent of the *Bourse Gazette* reports that the Germans have begun the evacuation of Poneviezh (in the Baltic provinces). The Zeppelin sheds near the town have also been taken down.

[Aeroplane sheds in all probability.—ED.]

BALKANS

January 7—German Raid on Salonika—According to a Sofia telegram, a German air squadron of 12 aeroplanes on January 7 dropped 78 bombs on Salonika, especially on the camp of the British and French troops. It is stated that 20 bombs took effect and caused a fire in the camp. Two of the Allies' aeroplanes, it is declared, were shot down, while the German squadron returned without loss.

January 7—Air Fight over Salonika—A French machine returning from reconnaissance was attacked by two German aeroplanes. The Frenchman, repeatedly struck, and with his observer wounded, was compelled to land. The Germans were chased off by anti-aircraft fire. It appears that this incident gave rise to the rumour that a German machine had been brought down.

[According to the French official report, a Hun was brought down on the morning of January 8.—Ed.]

January 9—Activity of French Aviators—A despatch from Salonika gives further details of the splendid work accomplished by the French air squadrons before the entrenched camp. During the month of December the aeroplanes attached to the Army of the East carried out innumerable reconnaissance flights, at times extending to 150 miles inland, and have effected no less than 21 bombardments. Bulgar deserters affirm that the bombardment of Ghevgei, at the end of December, was particularly destructive. Since the beginning of January massed squadrons have bombarded enemy concentrations in the regions of Patrigh, Ghevgei, Mirowe, and north of Doiran, with excellent results. It is stated on reliable authority that a bomb dropped on Patrigh killed a colonel, two captains, and eight soldiers. On January 7 a big fire was caused in an enemy encampment at Volovec, near Doiran.

January 9—Bombs on Sofia—A despatch from Salonika states that a flotilla of French aeroplanes flew over Sofia and dropped bombs, causing considerable damage and creating indescribable panic among the inhabitants.

January 9—Renewed Attack on Salonika—Another German Taube appeared over Salonika yesterday morning (January 8), and dropped bombs on the encampment at Haghia, Paraskevi, and the suburbs of the town. There were no casualties. A French aeroplane immediately rose in pursuit, and the German machine retired hastily. In the previous day's air raid (January 7), in which two Taubes took part, about eighty bombs were dropped, many of them near the Villa Allatini and in its neighbourhood. The warships opened a brisk fire on them, and they were forced to retire. It is said that one enemy craft was hit and fell within the French lines. These frequent reconnaissances by the enemy and other signs are said to point to an approaching offensive on the Allied front.

January 10—Bombs on Bulgarian Camp—Advices from Salonika state that two French aeroplanes have dropped bombs on a Bulgarian camp at Ghevgei. Considerable damage was caused.

January 11—New German Aerodrome—The Germans have constructed a new aerodrome at Uskub.

January 13—British Aviator over Monastir—Aeroplanes have been busy during the past few days. Yesterday, January 12, a number of French machines carried out a raid on the enemy positions in the north. A large number of bombs were dropped, and it is believed serious damage was done. Yesterday, January 12, too, a British aviator flew over Monastir, in a strong wind. He was fired on from the town, where it is established that considerable forces are stationed, but was not hit.

January 14—Aerial Activity at Salonika—A French air squadron yesterday successfully shelled the Germano-Bulgarian Headquarters at Negortzi, north of Ghevgei, setting fire to two large buildings occupied by the enemy's Staff. A German aeroplane has been brought down near Orfano. Another German machine to-day (January 14) threw several bombs aimed at the French camp, none of which hit the camp. But one fell on an adjacent Greek camp, killing one Greek soldier and wounding two others.

January 15—French Aviators Bomb Railway—French aeroplanes dropped bombs on the railway line to Ghevgei.

January 15—French Aeroplanes at Salonika—A flotilla of 15 French aeroplanes yesterday afternoon performed a series of most graceful evolutions at a height of 1,000 yards over the city.

January 16—German Machine Brought Down—British guns brought down a German aeroplane which was flying over the Allies' lines this afternoon, January 16. The machine fell within the occupied zone. It caught fire in falling and was destroyed. Both aviators were killed.

January 16—Allied Air Raid on Bulgar Camp—Fifteen Allied aeroplanes threw bombs, causing fires to break out in the Bulgarian camp, wounding numerous soldiers. A telegram from Sofia quotes a report from Kambana to the effect that German aeroplanes bombarded the railway station of Kilindir, which had been occupied by the French. One benzine depot was destroyed by fire, and two French aeroplanes were destroyed in aerial battle. The German aeroplanes, it is added, returned undamaged.

ITALY

January 12—Enemy Aeroplane Brought Down—A telegram from Rome states that on Tuesday (January 11) four Austrian aeroplanes flew over Rimini and threw bombs. Nobody was hurt, and the damage done was only slight. One of the aeroplanes was brought down by the Italian anti-aircraft guns and fell into the sea.

BELGIUM

January 10—Bombs on Train—The *Echo Belge* learns that a railway train has been hit by a bomb dropped by an allied aviator, near the village of Opwyck, at the junction of the Brussels-Termonde and Antwerp-Alost lines. The damage done was considerable.

HOLLAND

January 12—German Aviators Interned—The *Telegraaf* learns that a German aeroplane fell into the sea near the North Hinder Light-

ship to-day. The occupants were rescued by a boat from the lightship and afterwards brought by a Dutch naval tug to Holland, where they will be interned.

GERMANY

January 13—German Aeroplane Over Holland—On Monday afternoon (January 10) a German aeroplane coming from Belgium flew over the Dutch village of Sas van Gent. The aeroplane was heavily fired at by Dutch soldiers and was hit. The *Telegraaf* reports that soon after the machine had recrossed the frontier it capsized.

January 15—Zeppelin Fever—The building of Zeppelins continues with feverish energy. The latest types carry not only large bombs but also powerful searchlights attached to long cables. These are supposed to serve the purpose of blinding enemy artillerymen. The Berliner's favourite topic of conversation is a great air attack on London during the coming "Zeppelin season."

AVIATION IN THE FRENCH PARLIAMENT

The interpellations in the French Chamber of Deputies regarding the Government programme in the matter of military aviation will be heard on Thursday, January 20. The interpellations stand in the names of MM. Adolphe Girod (Major in the Air Service), Paul Laffont and Loret d'Aubigny, and are founded on criticisms that have lately appeared in the French press and the *Journal* in particular. Before then, however, M. René Besnard, Under-Secretary for Military Aeronautics, will make full reports to the Committees for the Army and for the Budget, which may render a public discussion of the matter unnecessary, according to the hopes of the Prime Minister, M. Briand. In consenting to the postponement of his interpellation until next Thursday, Major Girod made a speech containing the following passage: "From the beginning of this crisis in the aviation service we have seen the publication in certain newspapers, without the slightest regard to consequences, of articles giving information to the enemy. It is time that this condition of affairs was finally ended. This process of moral disorganisation created in the aviation service by outside machinations must be put a stop to, and its officers must be free to do their work without interference."

BENEVOLENCE

Brooke Hill, Isle of Wight, a fine new residence built by the late Sir C. Seely, Bt., has been placed at the disposal of the Royal Flying Corps by Brigadier-General J. E. B. Seely, D.S.O., to be used as an officers' convalescent home. It will be opened almost immediately.

[Without wishing to re-open an unpleasant subject which may well be suffered to be dormant until the end of the war, we cannot refrain from drawing attention to the singular tactlessness of General Seely in making this offer. Both as Under-Secretary and later as Secretary for War, this officer did more to retard the development of the Royal Flying Corps than any other cause. Those who know the inner history of his administration, so far as aviation is concerned, may well be excused for the thought that the gift might have been bestowed elsewhere with a better grace.—Ed.]

HONOURS FOR THE ROYAL FLYING CORPS

A Supplement to the *London Gazette*, dated January 14, 1916, announced the following promotions and appointments for members of the Royal Flying Corps to date from January 1, for service in the field:—

CHANCERY OF THE ORDER OF SAINT MICHAEL AND SAINT GEORGE

C.M.G., ADDITIONAL MEMBERS

Lieut.-Col. Edward Bailey Ashmore, M.V.O., R.A. and R.F.C.
Maj. Francis Leicester Festing, Northumberland Fusiliers and R.F.C.

PROMOTIONS

To be Brevet Majors:—
Capt. (temp. Maj.) D. S. Lewis, D.S.O., R.E., and R.F.C.
Capt. (temp. Maj.) G. S. Shephard, Royal Fusiliers, and R.F.C.

DISTINGUISHED SERVICE ORDER

Maj. Ralph Longstaff, R.A., attached R.F.C.

THE MILITARY CROSS

Capt. Harold Blackburn, R.F.C. (S.R.).
Lieut. (temp. Capt.) Arthur Sheridan Barratt, R.A. and R.F.C.
Lieut. (temp. Capt.) William Claud Kennedy Birch, Yorks R. and R.F.C.
Lieut. William Sholto Douglas, R.A. (S.R.), and R.F.C.
Temp. Lieut. Alfred John Evans, Special List, attached R.F.C.
Lieut. (temp. Capt.) John Lawson Kinnear, Liverpool Regt. and R.F.C.
Temp. Lieut. Aubrey Hastings Parker, Punjab Volunteer Rifles and R.F.C.
Lieut. (temp. Capt.) Patrick Henry Lyon Playfair, R.A. and R.F.C.
Temp. Lieut. Frederick James Powell, R.F.C.
Lieut. (temp. Capt.) William Ronald Read, 1st Dragoon Guards and R.F.C.
Lieut. (temp. Capt.) Charles Edmund Ryan, R.A. and R.F.C.
Temp. Lieut. Herbert Martin Sison, A.S.C. and R.F.C.
Lieut. Alastair Somervail, K.O.S.B. (T.F.), and R.F.C.

Second Lieut. (temp. Lieut.) William Henry Dyke Acland, Royal Devon Yeomanry (T.F.) and R.F.C.
 Temp. Second Lieut. (temp. Capt.) Ewart Douglas Horsfall, Rifle Brigade (Service Bn.) and R.F.C.
 Second Lieut. (temp. Capt.) Erik Harrison Mitchell, R.A. and R.F.C.
 Temp. Second Lieut. (temp. Capt.) Percy Moody, Royal Welsh Fusiliers.
DISTINGUISHED CONDUCT MEDAL
 2085 First-class Air Mechanic F. Hartley.
 4917 Second-class Air Mechanic F. S. Mackrell.
 1689 Corporal E. P. Roberts.
 3038 Sergt. F. V. Wright.

MENTIONED IN DISPATCHES

From Vice-Admiral Sir R. Bacon's Despatch, dated December 3, 1915. The following officer has been commended for service in action :
 Flight Commander Francis Knox Haskins, R.N.

It was announced in the London *Gazette* of January 14 that the King had been pleased to approve of the Albert Medal of the Second Class being conferred upon Michael Sullivan Keogh, Chief Petty Officer of His Majesty's ship *Ark Royal*, in recognition of his gallantry in endeavouring to save life, as detailed below :

On August 19, 1915, an aeroplane, piloted by the late Captain C. H. Collet, D.S.O., R.M.A., was ascending from Imbros Aerodrome, and had reached a height of 150 ft. when the engine stopped. The machine was upset by the powerful air currents from the cliffs, and fell vertically to the ground, while the petrol carried burst into flames which immediately enveloped the aeroplane and pilot. Chief Petty Officer Keogh, upon arriving at the scene of the accident, at once made an attempt to save Captain Collet by dashing into the midst of the wreckage, which was a mass of flames. He had succeeded in dragging the fatally injured officer nearly clear of the flames when he was himself overcome by the burns which he had received from the blazing petrol.

FOREIGN ORDER FOR BRITISH OFFICER

The King has granted authority to the following to wear the decoration stated against his name, which has been conferred in recognition of valuable services rendered by him.

Commander C. R. Samson, D.S.O., R.N. (Wing Commander in the Royal Naval Air Service)—Cross of Chevalier of the Legion of Honour

CASUALTIES

MISSING

January 1
 First Class Air Mechanic W. Holden, 2250, R.F.C.

January 2
 Sergeant E. Jones, 2104, Royal Flying Corps.

January 6
 Flight Commander Hans. A. Busk, R.N.

MISSING, BELIEVED KILLED

Undated
 Second Lieut. H. M. C. Ledger, Indian Army Reserve of Officers, attached R.F.C.

KILLED

Under date January 8
 Flight Sub-Lieut. Sidney A. Black, R.N.

ROYAL NAVAL AIR SERVICE

KILLED

January 10
 Probationary Flight Sub-Lieut. Gordon E. Duke, R.N.
 Warrant Officer, 2nd Grade, Percival V. Fraser, R.N.A.S.

ROYAL FLYING CORPS

DIED OF WOUNDS

January 6
 Captain J. G. D. Sanders, R.F.A. and Royal Flying Corps. (A notice of this officer's death appeared in our issue of January 12.)

MISSING

Lieut. G. C. Formilli, R.G.A., attached Royal Flying Corps.

Lieut. A. L. Russell, Royal Flying Corps.

Second Lieut. W. E. Somervell, L.N. Lances. R. and Royal Flying Corps.

January 12
 Flight Sub-Lieut. James S. Bolas, R.N.

KILLED

January 11
 Flight Sub-Lieutenant Cecil Horace Brinsmead, R.N.

Flight Sub-Lieutenant Cecil Horace Brinsmead, R.N., was born at Sydney on July 10, 1893. He was the second son of the late Horace E. Brinsmead, sometime managing director of John Brinsmead and Sons, the pianoforte manufacturers. Sub-Lieutenant Brinsmead was educated at Mr. Cherrill's School in Hampstead and at the University College School. He became an apprentice in the merchant service. Anxious to serve his country with as little delay as possible he put in for both the Army and the Navy, hoping to secure a commission in one or the other service, and by a coincidence was gazetted simultaneously to a second lieutenancy and to a flight sub-lieutenancy. He chose the latter commission and speedily won distinction at Eastchurch and on Salisbury Plain as a skilful aviator. He left this country on October 30, and is among the first to fall for his country in the new campaign now opening near Salonika.

TWO EASTBOURNE FATALITIES

About 2.30 on January 10 an aeroplane was seen flying in the vicinity of Hampden Park, Eastbourne. The machine was rather low down and appeared to be very unsteady. Eventually it fell into a meadow near a brickfield and was smashed, its two occupants being killed. The bodies were removed to the Eastbourne mortuary.

The aviators killed were : Lieut. Gordon Duke, 25, a Canadian, and Warrant Officer Fraser, aged 36. The machine fell from a height of about 150 ft.

The East Sussex Coroner (Dr. G. Vere Benson), at Eastbourne Town Hall, on January 12, held an inquest on the bodies of the above-mentioned

Commander Philip Shepherd stated that Sub-Lieut. Duke joined the Royal Naval Air Service on December 16 last. In Toronto he was a clerk in the municipal department.

Richard Hutton, second air mechanic in charge of the Royal Naval Air Service at Eastbourne Aerodrome, said that Mr. Fraser was the pilot and Sub-Lieutenant Duke the passenger. The witness, who watched the machine in flight, thought that something must have gone wrong with the elevation control.

Commander Philip Shepherd said he had examined the remains of the machine. One wire had slipped off a pulley. This might have happened when the accident occurred. The elevators could not be used if the wire had slipped. He was of opinion that if the wire slipped it did so when the machine was in the air.

The jury returned a verdict of "Accidental death."

APPOINTMENTS

ROYAL NAVAL AIR SERVICE

Probationary Flight Sub-Lieuts. :

The Hon. N. G. H. Sturt, B. C. Tooke, and J. J. de la T. Fox, all confirmed in the rank of Flight Sub-Lieut., with original seniority, and all reappointed to the *President*, additional, for R.N.A.S., to date November 29, December 18, and January 1 respectively.

The undermentioned Probationary Flight Sub-Lieuts. (temporary) have been confirmed in the rank of Flight Sub-Lieut., with original seniority, and all reappointed to the "President," additional, for R.N.A.S., to date as follows :

E. T. Bradley and G. L. E. Stevens : December 6.

L. P. Paine and C. A. Eyre : December 14.

G. H. Bettinson : December 18.

T. R. Hackman, T. G. M. Stephens, R. A. Courtnage, C. H. Darley, and G. Moore : December 21.

J. A. Sparrow and H. E. C. Plowden : December 22.

C. Murray : December 23.

R. E. Dean, H. C. G. Allen, and H. L. E. Tyndale-Biscoe : December 24.

W. M. Tait : December 27.

E. M. King, H. G. Page, F. C. Henderson, F. A. R. Malet, G. A. Maclean, W. R. Dainty, and W. Man : December 30.

R. S. W. Dickinson : December 31.

T. C. Lloyd, entered as Probationary Flight Sub-Lieut., with seniority of January 4.

G. R. Moody, granted a commission as Temporary Lieut. (R.N.V.R.), with seniority of January 11, and appointed to the *President*, additional, for (E.) duties with the R.N.A.S. (appointment as Probationary Flight Sub-Lieut., temporary, terminated).

G. P. C. Greene and J. C. A. Jenks, both entered as Temporary Sub-Lieuts. (R.N.V.R.), with seniority of January 11.

Flight Commander :

J. D. Maude, to *Empress*, vice Bailey : January 13.

Temporary Sub-Lieut. :

Mr. M. F. Browne, entered as Sub-Lieutenant (Royal Naval Volunteer Reserve), for temporary service, with seniority of January 13 and appointed to *President*, additional.

Probationary Flight Sub-Lieuts. confirmed in the rank of Flight Sub-Lieut. :

Hon. Napier G. H. Sturt : May 12, 1915.

Humphrey E. C. Plowden : June 8, 1915.

George H. Bettinson : June 27, 1915.

William Man : June 30, 1915.

Harold L'E. Tyndale-Biscoe : July 11, 1915.

Richard S. W. Dickinson : July 12, 1915.

Leo P. Paine : July 18, 1915.

Cyril A. Eyre : July 23, 1915.

Ronald E. Dean : July 26, 1915.

William R. Dainty : August 8, 1915.

Arthur Sparrow : Aug. 19, 1915.

Eric T. Bradley : August 21, 1915.

Trevor R. Hackman : August 29, 1915.

Ross A. Courtnage : September 1, 1915.

Cecil H. Darley : September 1, 1915.

Thomas G. M. Stephens : September 1, 1915.

Frederick C. Henderson, September 1, 1915.

Herbert J. Page : September 3, 1915.

Hubert C. G. Allen : September 5, 1915.

George L. E. Stevens : September 6, 1915.

William M. Tait : September 11, 1915.

Cecil Murray : September 12, 1915.

Eliot M. King : September 18, 1915.

Francis A. R. Malet : September 18, 1915.

Gerald A. Maclean : October 2, 1915.

John J. de la T. Fox : October 17, 1915.
Benjamin C. Tooke : October 17, 1915.
Geoffrey Moore : October 24, 1915.

The undermentioned have been entered as Probationary Flight Sub-Lieuts. (temporary), with seniority as follows, and all appointed to the "President," additional, for R.N.A.S. :

G. P. Powles and O. R. Griffin : December 24.

J. E. Northish : January 14.

R. A. Little : January 18.

E. J. Travers, entered as Sub-Lieut. (R.N.V.R.), with seniority of January 5, and appointed to the *President*, additional, for R.N.A.S.

E. E. W. Butt, granted a temporary commission as Sub-Lieut. (R.N.V.R.), with seniority of January 14, and appointed to the *President*, additional, for R.N.A.S.

W. F. Cleghorn and L. H. Parker, both entered as Probationary Flight Sub-Lieuts. (temporary), with seniority of December 16, and appointed to *President*, additional, for R.N.A.S.

Capt. the Hon. W. F. Forbes Sempill (Master of Sempill), Royal Flying Corps, Special Reserve, has been entered as a Flight Commander for temporary service : January 1.

Chief Petty Officer (3rd Grade) :

H. G. P. Browne, promoted to Warrant Officer (2nd Grade), for temporary service, with seniority of January 7, and appointed to the *President*, additional, for R.N.A.S.

Surgeon Probationer (R.N.V.R.) :

G. Donald, entered as Probationary Flight Sub-Lieut. with seniority of January 10, and appointed to the *President*, additional, for R.N.A.S.

W. R. Stennett, entered as Temporary Sub-Lieut. (R.N.V.R.), with seniority of January 10, and appointed to the *President*, additional, for R.N.A.S.

ATTACHED TO HEADQUARTER UNITS

Staff Officers Royal Flying Corps (graded for purposes of pay as Staff Captains) :

Major Arthur L. Godman, Alexandra, Princess of Wales's Own (Yorkshire Regiment) from a General Staff Officer, 3rd Grade ; Major Reginald J. Armes, The Prince of Wales's (North Staffordshire Regiment), from a General Staff Officer, 3rd Grade ; Captain Carlos Bovill, Royal Artillery, from a General Staff Officer, 3rd Grade ; Captain Richard R. de C. Grubb, 3rd (King's Own) Hussars : November 27, 1915.

Staff Capt. :

Temporary Capt. C. F. Lee, West Somerset Yeomanry, Territorial Force, from a Wing Adj., Royal Flying Corps : December 18, 1915.

ROYAL FLYING CORPS

The following appointments are made :

Squadron Commander (from Flight Commander) :

Maj. A. B. Burdett, York and Lancaster Regt. : December 17.

Flight Commanders (from Balloon Officers) :

Capt. F. H. Shaw, West Riding Divisional Train, A.S.C., Territorial Force : December 18.

And to be Temporary Capt. whilst so employed :

Temporary Lieut. A. H. Parker, General List : December 18.

From Flying Officers :

Second Lieut. (Temporary Lieut.) R. A. Saunders, R.F.A., Territorial Force ; Second Lieut. A. T. Whitelock : December 20.

Wing Adjutant :

Captain Cedric F. Gordon, Prince of Wales's (North Staffordshire Regt.), and to be seconded, vice Captain B. C. Fellows, retired, Indian Army : December 18, 1915.

Flight Commander :

Temporary Lieut. H. Whitaker, R.E., from a Balloon Officer, and to be temporary Capt. whilst so employed : December 3.

Flying Officers :

Lieut. R. H. B. Ker, Canadian Local Forces : January 1, 1916.

Second Lieut. Henry O'N. de H. Segrave, Royal Warwickshire Regt., and to be seconded : January 1, 1916.

Sec. Lieut. Lawrence A. Wingfield, Royal Fusiliers (City of London Regt.), Special Reserve, and to be seconded : December 20, 1915.

Maj. S. Smith, R.F.A., Territorial Force ; Lieut. Dermot J. Sheridan, Princess Victoria's (Royal Irish Fusiliers), and to be seconded ; Temporary Lieut. E. R. M. Griffin, A.S.C., and to be transferred to the General List ; Second Lieut. Philip B. Prothero, Princess Louise's (Argyll and Sutherland Highlanders), Special Reserve, and to be seconded ; Temporary Second Lieut. A. T. Wynyard-Wright, East Surrey Regt., and to be transferred to the General List ; Sec. Lieut. J. E. Evans, Royal Welsh Fusiliers, and to be seconded ; Second Lieut. S. Dalrymple, Special Reserve : December 21, 1915.

Second Lieut. Samuel J. Sibley, Special Reserve ; Second Lieut. Charles I. Carryer, East Yorkshire Regt., and to be seconded ; Second Lieut. Arnold Hunt, Special Reserve : December 24, 1915.

Equipment Officers :

Second Lieut. (temp. Lieut.) P. H. Linthune, London Regt., Territorial Force, from an Asst. Equipment Officer, and to be temp. Captain whilst so employed : December 30, 1915.

Second Lieut. A. M. Low, Special Reserve, from an Assistant Equipment Officer, and to be Temporary Capt. whilst so employed : December 22.

Hampshire Aircraft Parks :

The Christian names of Temporary Lieut. Reginald Montagu Spalding Maxwell are as now described, and not as previously notified.

ROYAL FLYING CORPS—SPECIAL RESERVE.

Second Lieuts. (on probation) confirmed in their rank :

R. A. Logan, F. J. H. Thayer, A. Goodfellow, T. C. Wilson, R. K. Shives, C. Hitzel, E. H. Robinson.

A. Lang, S. J. Sibley, A. L. Curtis, H. R. Lecomber, W. D. L. Jupp, S. Davenport, C. T. Inman, J. N. D. Heenan, J. N. Mearns, B. Mott, R. T. Lattey.

MILITARY WING.

Second Lieut. (on probation) :

J. S. D. Harries-Jones, previously described as H. Jones in *Gazette* of December 23, 1915, is confirmed in his rank.

Lieut. J. K. Aird, Canadian Militia : November 25.

J. M. Furnival : December 17.

C. G. Jones : December 19.

R. E. H. Daniel, H. Phillips : December 20.

A. N. Patterson : December 30.

L. J. Pearce, G. F. Blackburn, E. H. Johnston, T. Hawkins, C. E. Blayney, F. McD. C. Turner, G. S. Thorne, H. H. Turk, J. Hay, H. W. Norman, L. R. Kerridge, J. F. A. Day, R. J. Bennett, E. R. Gunner : January 3.

S. N. Cole : January 10.

A. N. Buchanan : October 29.

H. P. Boot, J. D. Troup, J. A. Gibson, O. V. Thomas, L. A. Clayton, J. G. Hutt : December 20.

Harold H. Baron : December 13, 1915.

Edward F. Allen : December 13, 1915.

Cecil A. Lewis : December 13, 1915.

Cuthbert J. Creery : December 15, 1915.

Edmund S. Duggan : December 15, 1915.

Ernest Duveen : December 22, 1915.

Phillips D. Rader : December 28, 1915.

Special Reserve :

Capt. J. A. Chamier, 33rd Punjabis, Indian Army : December 29.

Capt. H. Wyllie, Hampshire Regt., Territorial Force : October 14.

And to be Temporary Capts. whilst so employed :

Lieut. W. S. Douglas, R.F.A., Special Reserve ; Lieut. A. M. Morison, Special Reserve : December 27.

Second Class Air Mechanic Clifford S. Kent, from Royal Flying Corps, to be Temporary Second Lieut. : December 16, 1915.

PROGRESS AT THE FLYING SCHOOLS

The Hall School—An excellent week's practice was put in by the pupils of the Hall School during the past week, and Royal Aero Club Certificates were taken by Captain Grey (Indian Army), Stirling (son of late Lord Mayor of Doncaster), Butterworth, Shum, Mann, whilst Wilkins made the tests A and B. The majority of the other pupils are getting on in good style. With Cecil M. Hill and H. Stevens—Redford, Evans, Butterworth, Cook, Nicolle, Sepulchre, Shum, Mann, Dresser, Punnett. All doing circuits or half-circuits, figures of eight. With John Drew and Anstey Chave—Baron Ackroyd, Arnsby, Chapman, Collins, Niel, Lieut. Cooke, Millburn, Rayne, Ridley, Robert, Rochford, E. Smith, Thom, Wooley, Ormerod, Camberbirch, S. Smith, Mahoney. All doing rolling practice and straight flights. Machines in use—Hall & Caudron Government type Tractors.

The Grahame-White Schools—Report of the progress of pupils for the week ended January 14 : *Civilian School*—Straights with instructor—Barret, Butler, Eichelbrenner, Hathaway, Hillaby, Williams, Smith and Verguill. Circuits with instructor—Grassett, Hallet and McClaughrie. Circuits alone—Hughes. *R.N.A.S.*—Straights with instructor—Probationary Flight Sub-Lieuts. Aitken, Colquhoun, Cook, Cuckney, Rampling, Rees, Rockey and West. Circuits with instructor—Probationary Flight Sub-Lieuts. Burden, Jones and Newton. Instructors during week : Biard, Hale, Manton, Pashley, Russell and Winter.

The Ruffy-Baumann School—One or two opportunities have this week arisen for school work and the following pupils were enabled to put in their practice on the 50 and 60 h.p. machines. A great deal of work has again been accomplished inside the sheds and erecting is progressing rapidly. With instructor—Muspratt, Thomsen, Durand, Edgar, Whitaker, Hoskyn, Cox, Yiule, Laidlaw, Cuthbertson, Flanders. Straights or circuits—Vernon, Griffith, de Launoit, Hamtiaux and Pauli. Certificate taken—Pauli, of the Aviation Militaire Belge. This ticket was taken in brilliant style and finished with a clever vol-plane. Instructors—Edouard Baumann, Felix Ruffy, Ami Baumann and Clarence Winchester.

The London and Provincial School—School report : Instructors—W. T. Warren, M. G. Smiles, C. M. Jacques, H. Sykes and W. T. Warren, jun. Pupils doing rolling—Snow, Aldous, Egelstaff, Vertongen, Loomes, Dawson, Darwin, Pulford, Stevens and Verbessem. Pupils doing straights—Hardy, Heyn and Van Roggen. Pupils doing circuits—Thorp, Hunt and Lieut. E. R. Manning. Three Royal Aero Club Certificates were taken this week by Lieut. E. R. Manning on Sunday, and Thorp and B. H. Hunt on Wednesday.

ALLIED AERIAL CONFERENCE

It is announced on the authority of the *Matin* that "The necessary unity of direction between the Allies is showing itself in the creation in Paris of a monthly Anglo-French conference on military aviation. Other Allied nations will also be brought to take part in it."

"The Russian mission has already arrived, and not only is the dispatch to Russia of French airmen as instructors contemplated, but also the dispatch to France of Russian airmen, who would come to form and instruct our units intended for the Eastern theatre of war."

The same communication goes on to say that since the beginning of the war the French aviation industry has supplied the Allies with one-fifth of its total production of aeroplanes and one-third of its output of aero-engines

STATEMENTS IN PARLIAMENT

HOUSE OF COMMONS

January 11. *Anti-Aircraft Service*—Mr. King (R., Somerset, N.) asked the Under-Secretary for War whether officers and men of the Royal Artillery who were available for foreign service were now doing duty on anti-aircraft guns and searchlights in the London area; and, if so, whether the work performed by these officers and men, especially the searchlight duties, would, wherever possible, be entrusted to other men, preferably those above the military age.

Mr. Tennant: It has been found by experience that the men above military age, as a rule, are not quick enough in the service of the guns to be considered suitable for employment at this particular work. Every endeavour is being made to relieve men fit for service abroad.

OFFICIAL NOTICES

THE ROYAL AERO CLUB OF THE UNITED KINGDOM

AVIATORS' CERTIFICATES

The following Aviators' Certificates have been granted:—

- 2248 Second Lieut. Rudolph Dunstan Vavasour, R.F.A. (Maurice Farman Biplane, Military School, Norwich). December 9, 1915.
- 2249 Second Lieut. Alfred Eliison (General List) (Maurice Farman Biplane, Military School, Catterick Bridge). December 16, 1915.
- 2250 Flight Sub-Lieut. Eric Barton Thompson, R.N.A.S. (Maurice Farman Biplane, Royal Naval Air Station, Chingford). December 19, 1915.
- 2251 Flight Sub-Lieut. Robert Henry Horniman, R.N.A.S. (Grahame-White Biplane, Grahame-White School, Hendon). January 5, 1916.
- 2252 Sergt. John Grant McKenzie Martin Stronach, R.F.C. (Maurice Farman biplane, Military School, Shoreham). January 5, 1916.
- 2253 Lieut. Edyc Rolleston Manning, 15th Hussars (L. and P. Biplane, London and Provincial School, Hendon). January 9, 1916.

AERONAUT'S CERTIFICATE

The following Aeronaut's Certificate has been granted:—

- 59 Warrant Officer Alfred Charles Wright, R.N. January 10, 1916.

NEW YEAR HONOURS

The King has been graciously pleased to give orders for the following promotion in the Most Honourable Order of the Bath:—

K.C.B.

Col. Henry Capel Lofft Holden, C.B.

(Sir Capel Holden has been a Vice-Chairman of the Club since 1913.)

GRANT OF THE VICTORIA CROSS

The King has been graciously pleased to approve of the grant of the Victoria Cross to Squadron-Commander Richard Bell Davies, D.S.O., R.N.

(Squadron-Commander R. B. Davies has been a Member of the Club since 1911.)

PATENT INFORMATION

This list is specially compiled for AERONAUTICS by Messrs. Rayner and Co., Registered Patent Agents, of 5, Chancery Lane, London, from whom all information relating to Patents, Designs, Trade Marks, etc., can be obtained gratuitously.

APPLICATIONS FOR PATENTS

- 18,105 Vickers, Ltd., and Harold Arthur Savage. Aircraft. 28/12/15.
- 18,107 Harry Macaulay. Engineers' "V" blocks for marking off aeroplane or motor crank shafts and the like. 29/12/15.

SPECIFICATION ACCEPTED

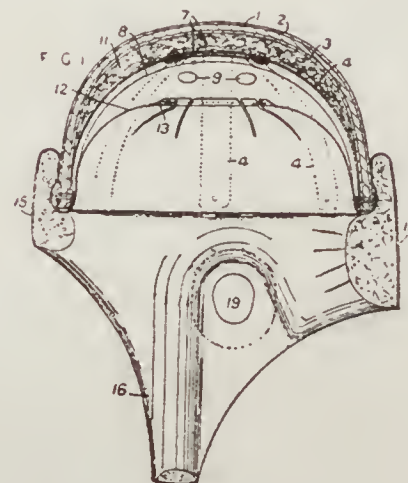
- 24,664 Mitchell. Aerial plumb or aerial sight for guns and the like.

SPECIFICATION PUBLISHED THIS WEEK

- 616 Gray and Best. Searchlights.

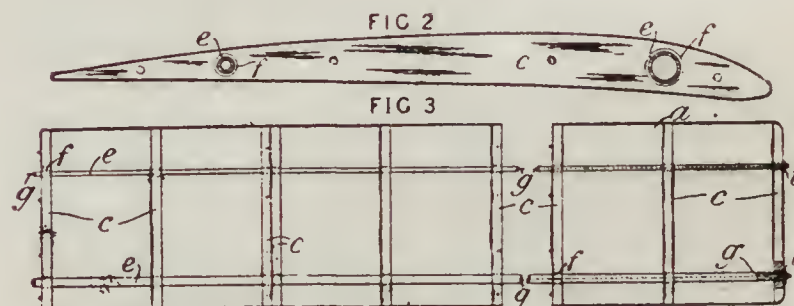
LATEST PUBLISHED ABSTRACTS

- 10,109 "Helmets." C. H. Curtis, 12, Grafton Street, New Bond Street, London. In an aviator's helmet the part of the dome to which the lower ends of the spring (4) are attached is of approximately oval shape to fit the wearer's head; the upper ends of the spring are rigidly connected to metal plates (7), and a band fits around the head. The helmet comprises a leather or other



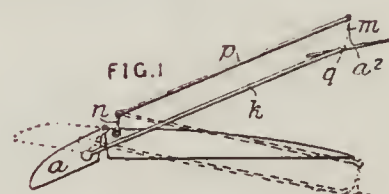
waterproof cover (2), a cork dome (1), preferably in two layers with a cotton lining (3), and cottonwool padding (11) above and a leather lining (8) below the springs (4) and plates (7). A leather cap (12) with a draw-string (13) fits down on the head of the wearer. Openings (19) for the ears are covered by stiffened flaps fastened at their front edges. The securing straps (16) pass under the jaw of the wearer, well back from the chin. Ventilation holes (9) are provided.

- 10,516 "Aeronautics." S. E. Saunders, White House, East Cowes, Isle of Wight. The planes of aircraft are made of a number of hollow sections of suitable shape threaded on and secured to supporting spars. The sections consist of ribs *c* covered with multiple-ply wood or fabric. The ribs *c* have holes brushed with metal *f* through which the tubular spars *e* pass. The sections are held together



by wires *g* passing through the spars and having bolts at their ends secured to plates *i*. The adjacent ribs of the sections are provided with dowel pins and slots to prevent the plane from warping. The hollow planes are buoyant on water.

- 10,572 "Aeronautics." G. H. Short, 10, Burlington Road, New Malden, Surrey. The front part of the laterally extending wings of an aeroplane is hinged to the main part and controlled by a wind-vane so that the camber of the wing is varied according to the movements of the vane. The attitude of the vane may be controlled by the pilot for steering, the hinged front part *a* is secured to rods *k* carrying the pivoted wind-vane *a*². The arm *M* on the



vane is connected by a link *p* to a crank *n* pivoted to the wing *B* and controlled by the pilot. A gust striking the under surface of the vane raises it into position shown in full lines in Fig. 1.

Printed copies of the accepted and published specifications can be obtained from Messrs. Rayner and Co., at the price of 1s. each.

MEETINGS

THE MILE END ELECTION

Mr. N. Pemberton-Billing will be the independent candidate for the vacancy in the Parliamentary representation of Mile End, by the succession of Col. the Hon. Harry Lawson to the peerage. Mr. Pemberton-Billing states that he had retired from the naval air service for the sole purpose of pressing the claims of the air service upon the Government. Having been convinced that this might best be done in the House of Commons itself, he had taken the earliest opportunity of seeking election and now came before the electorate of Mile End as the first Parliamentary candidate to offer himself for election on an air "ticket." His policy was the proper organisation, development, and direction of the air service. He would make a strong point of the present inadequate use made of the men and material already at the disposal of the Government, especially in reference to the defence of London. When the defence was put in the hands of practical air-men London, he maintained, would be perfectly secure from any air raids, and might safely put her lights up once more.

According to Mr. Billing's statements, he is chiefly concerned with the air defence of London. This, he believes, should be in the hands of a young, capable, energetic, and brave commander, who should be responsible for the whole thing. He should be properly appreciated if he was successful, and properly punished if he failed. Mr. Billing is no supporter of the policy of darkened streets. The only place where the lowering of lights is justified, he states, is on the coastline. The melancholy gloom in London is doing no good. It depresses people, and is helpful rather than puzzling to the Zeppelin pilots. He suggests that the people responsible for keeping down the lights should be taken for a flight over the city when the lights are lowered and again with the lights in full blaze. The experience would convince them of the error of the present system.

[We have only to add to this statement that we wholly and entirely disagree with the views it expresses, if they have been correctly reported, regarding the lighting of London—Ed.]

LEGAL NEWS

In the Divorce Court, before Mr. Justice Baggallay Deane, on January 13, Mrs. Dorothy Cadwell Grahame-White was granted a decree of restitution of conjugal rights against her husband, Mr. Claude Grahame-White. There was no defence.

THE BLERIOT MANUFACTURING AIRCRAFT CO., LTD.

There was a good deal of disorder at an extraordinary general meeting of the Blériot Manufacturing Aircraft Company, held on January 13, at the Hotel Metropole, to consider resolutions relating to the future conduct of the business and the petition before the Courts for the winding up of the company.

The Duke of Manchester, who presided, said that various reasons had been given for M. Blériot's not having completed the transfer of the business. It was said that he did not understand the deed put before him; then that he was not given certain voting rights which he claimed, and also that M. Blériot objected to the presence on the directorate of Mr. H. J. Lawson. Upon proceeding to explain the circumstances which led to the resignation of Admiral the Hon. Sir E. Fremantle and other members of the original board, the chairman was so much interrupted that he declined to continue.

Several shareholders addressed the meeting at the same time, and a proposal that the company should be compulsorily wound up was received with cheers.

Mr. H. J. Lawson said that the shareholders' only chance of getting back their money in full was through him. Counsel, and others who knew, stated that the prospectus set forth the facts in a perfectly fair manner. He stood by the prospectus, and the bargain entered into was going to be carried out. They had got the works ready to be taken over immediately the little technicality which was holding matters up was settled by the Courts. He was quite willing, as were the chairman and the other directors, that representatives of the "cash shareholders" should go on the board, look into the position thoroughly, and decide what should be done.

A Shareholder: Will you retire?

Mr. Lawson: Certainly.

The Chairman, speaking for himself and his colleagues, other than Mr. W. A. Casson (the vice-chairman), who is acting in opposition to them, said that they were ready to resign in favour of substantial nominees of the "cash shareholders."

A resolution authorising the directors to proceed with the business of manufacture and selling aeroplanes, other than Blériot aeroplanes, and also, if it was thought desirable, to complete the purchase of the Blériot business or to vary the terms of the agreements with the vendors and M. Blériot, was defeated amid considerable interruption and cries of "Liquidation," very few hands being held up for it. An amendment stating that the shareholders present supported the petition which has been presented for the compulsory winding up of the company was carried almost unanimously.

When the Chairman demanded a poll there were several protests, and it was pointed out that the vote was taken as the opinion of the "shareholders here present," and that therefore proxies ought not to be used.

The board's resolution against the petition secured practically no support.

Mr. Casson said that the real issue would be fought in the Courts on January 18, and that would be the beginning of an investigation which would make some of them open their eyes.

The meeting ended in disorder after about three hours.

THE BRITISH PETROLEUM CO., LTD.

The importers and proprietors of "Shell" Motor Spirit regret very much the inconvenience which may be caused to their clients by temporary difficulties occurring from time to time in delivering their orders for motor spirit. They are supplying the great majority of the requirements of motor spirit for His Majesty's Forces in this country, and of the Expeditionary Forces in Europe and elsewhere. Owing to the unique and exceptional responsibility which they have accepted in this regard, they are frequently called upon to supply enormous quantities of motor spirit at very short notice, but they have deemed it their duty to meet these requirements even when—as occasionally happens—they involve some dislocation of the trade and some inconvenience to their other clients. In thus placing the national interest above other considerations, they invite the co-operation of their clients in order that their comrades at the front may have the advantage of ample supplies of the finest spirit that is available. With this object in view they ask their clients to limit their requirements to a minimum, and, avoiding all waste, to use every possible economy in the quantities consumed. Great assistance will also be rendered by refraining from the retention of a stock larger than is absolutely necessary.

WILLS AND BEQUESTS

Second Lieut. Wilfrid Stephen Bagott Parry, R.F.A. and R.F.C., of 83, Sunny Gardens, Hendon, for the last six years on the staff of Messrs. Rothschild, New Court, E.C., killed in Flanders, £521.

MESSRS. BROWN BROS., LTD.

It seems almost superfluous to enlarge upon the necessity of having perfect wiring, and recognising this fact Messrs. Brown Bros., Ltd., of Great Eastern Street, E.C., are marketing special covered ignition wire. That the merits of this wire are fully recognised is proved by the fact that it is largely used by the majority of constructors. A large stock is always on hand. Any quantity can be immediately supplied on receipt of a wire or 'phone message.

PETROL PRICES

The prices now ruling for motor spirit practically all over England and Wales are as follows:—Shell, 2s. 2d.; Shell II., 2s. 1d.; Crown, 2s.; Red Line, 2s. 1d.; Red Line II., 2s.; Pratt's, 2s. 2d.; Pratt's II., 2s. 1d.; Taxibus, 2s.; Mex, 2s.; Ensign, 1s. 11d. The price in Scotland is, generally speaking, a penny higher, and in Ireland it varies according to the district.

THE INSTITUTION OF MECHANICAL ENGINEERS

The General Meeting of the Institution of Mechanical Engineers will be held at the Institution of Civil Engineers, Great George Street, Westminster, on Friday, January 21, 1916, at 6 p.m., when Captain Thomas B. Morley, B.Sc. (of the University of Glasgow), Associate Member, will read a paper on "The Flow of Air Through Nozzles."

BOOK RECEIVED

"AIRCRAFT IN WARFARE." F. W. Lanchester. With introductory Preface by Major-General Sir D. Henderson, K.C.B. London: Constable & Co., 1916. Pp. 222, figs. and illus. Price 12s. 6d. net.

EXPORTS AND IMPORTS OF AIRCRAFT

EXPORTS

	VALUE					
	Month ended 31st Dec.			Year ended 31st Dec.		
	1913	1914	1915	1913	1914	1915
Acroplanes, Airships, Balloons, and parts thereof	1439	—	—	14868	17128	48791
Aeroplanes, Airships, Balloons and Parts thereof	6851	1031	28192	46756	19677	170466

IMPORTS

	VALUE					
	Month ended 31st Dec.			Year ended 31st Dec.		
	1913	1914	1915	1913	1914	1915
Aeroplanes, Airships, Balloons, and parts thereof	22955	32298	1293	244096	275259	35814

AERONAUTICS

A WEEKLY JOURNAL DEVOTED TO THE TECHNIQUE OF AERONAUTICS

(FOUNDED 1907)

Edited by JOHN H. LEDEBOER, B.A., A.F.Ae.S.

VOL. X. No. 119 (NEW SERIES)

JANUARY 26, 1916

[Registered at the G.P.O.]
as a Newspaper

ONE PENNY

THE FOKKER MYTH

NO doubt a censorship well applied serves a good purpose during time of war; but as with all methods of autocratic control it depends entirely upon the manner of its application. Ill-applied, it may defeat its own object. Now the function of the censorship is two-fold, in so far as I understand the matter: instituted primarily in order to prevent the publication of information likely to be of benefit to the enemy, its secondary duty is to maintain the *morale* of the public generally by preventing the dissemination of false news of a disquieting character. This, at any rate, is the meaning one reads into the speeches of various Ministers who have at one time or another represented the Press Bureau in an official capacity. No doubt the present regulations fairly enable it to fulfil its former main function; but the latter seems to be persistently and systematically ignored. The consequence is that the less scrupulous portion of the Press—for whom circulation is the essence of life and a flashing contents bill of far greater value than the truth—is enabled to raise one scare after another. Presently, of course, these scares vanish into thin air as the result of official statements in the House or through some other means of refutation. But meanwhile they have served their purpose. They are not designed to be long-lived.

Let the past bury the past. For the moment I am concerned with the present and with the Fokker scare in particular. Now I will state here in the most definite terms possible that this scare is a pure myth. The Fokker is not a new machine, nor does it embody any novel characteristics or hitherto untried perfections. It is just an ordinary monoplane rather heavily engined and consequently possessing great speed and climbing power, while being well adapted for rapid manoeuvring. As everyone acquainted with the subject knows perfectly well, we have plenty of machines able to cope with it. Whether it is fitted with an eighty horse-power Gnome, as was formerly the case, or with a 160 h.p. or 200 h.p. Mercedes matters not one jot. We possess machines at least as powerful, quite as efficient and speedier, and the engines too.

How, then, it may be objected, is one to account for the recent heavy casualties among members of the Royal Flying Corps, alleged to have been brought down in fair fight, or the recent considerable losses of machines reported by the Germans to have been destroyed, and at once seized upon by the scaremongers or the calamity-howlers, as the tribe is known in the United States, as proving our aerial inferiority? Two considerations arise. The first was clearly and truthfully exposed by Mr. Tennant in the House of Commons. These Fokkers and other machines of similar type are utilised simply as aerial destroyers and not for the primary legitimate purpose of the aeroplane, which is that of reconnaissance. Very good; but why should all the

destruction be left to the Huns while we meekly suffer ourselves to be attacked? Have we no destroyers capable of downing the German reconnoitring planes? We have, as the Huns would know to their cost if they ventured over our lines, which they have strict injunctions not to do *as a matter of routine*. Incidentally, as past records prove only too well, if it comes to a question of downing your opponent our pilots in a general way have a very good pull over the Hun. The truth is that, to judge from all appearances, the Germans have temporarily concentrated their best machines and pilots along a relatively narrow sector of our front, where they are present in overwhelming force. The reason for this—a favourite trick of theirs—is not far to seek. Evidently there are things going on behind their lines, movements and concentrations of troops, which they are particularly anxious to hide; hence their sudden frantic endeavour to chase our machines out of the sky. There is the more reason to suppose this to be the fact in that there has, comparatively speaking, been a marked lull in their aerial activities along other portions of both the Western and the Eastern fronts. Such aerial activity has always hitherto presaged a strong local offensive, from which we may deduce with some degree of certainty that the Germans are about to launch an attack against our portion of the far-flung line.

But another consideration comes to mind. The German reports that seventeen British machines have been brought down within the last few weeks, reports which have been avidly hailed as the truth by the scare-mongers, should be swallowed with more than a minute pinch of salt. Glance at the casualty lists for a moment. They indicate one noteworthy fact: by far the greater number of recent casualties to members of the Royal Flying Corps refer to wounded officers. Now our casualty lists may be dilatory; there may be a tendency to spread them over as long a period as possible. Even so, the inference is plain. The majority of the British machines reported as having been brought down and inferentially destroyed were, as a matter of fact, forced to descend, often making our own lines, by a wound inflicted on the pilot or observer—a very different matter from the sense of total destruction which it is sought to imply. Surely it is a strange proceeding nowadays to take the Hun at his own valuation and to judge him according to our own standard of honesty.

So now, as our paper goes to press, we may lay unction unto our souls for having divined correctly. Thirteen of our machines, it appears, have been “lost” in a month, as against nine or eleven of the enemy. So much for the Fokker menace.

Aviation Finance

Finance is a necessity in any class of business; yet for certain reasons in no way connected with its inherent nature, the very word has gradually acquired a not altogether savoury taste. Popularly, a man who describes himself as a "financier" is not supposed—to say the least of it—to dwell in the shining immaculate halls of perfect honesty. 'Tis true 'tis pity, and it's pity that 'tis true. There have been failures in the ranks of the aviation industry before now, but they have been honourable failures. Now in this unsavoury Blériot Aircraft Manufacturing Co. case, which has recently been thrashed out in the Courts, we come to one solitary exception. There is one consolation: the whole business, according to Mr. Justice Neville's summing up, which is given in full elsewhere in this issue, was simply a financier's ramp and essentially had nothing whatsoever to do with the aeroplane industry. Any other business would equally well have served the purposes of the person who engineered the deal, and did so, it must be admitted, with a great deal of ingenuity. We lay stress upon this point as we desire above all things to preserve unimpaired the good name and high honour of the aviation industry as a whole, the more so since it has become an essential medium for the supply of war materials. At the same time full credit for revealing Lawson's ingenious machinations should be accorded to our contemporary *Truth*, who first hit the trail and pursued it vigorously to the end. Anyway, this parasite company, permission to form which (and in so doing to extract money from the public) should never have been granted by the Treasury, has now ceased to exist, and the industry is the cleaner for its disappearance, which is no doubt hailed with joy by Messrs. Blériot, who, of course, had nothing to do with the whole matter.

Limits of Treasury Control

Incidentally, the enquiry produced during its course one extraordinary admission from officialdom, which should not be allowed to pass without comment. As is generally known, the permission of the Treasury has to be obtained for the formation of any new public company or the issue of fresh capital. In the case in question such permission was granted by the officials, apparently on the ground, if words have any meaning, that the syndicate was registered for the purpose of making munitions of war, without any enquiry being held regarding either the status of the company or of its promoters. In plain words this implies that the Treasury holds its control to be limited to the purpose for which new companies are professedly formed and not to the extent of its financial soundness. In the present case the most superficial investigation would have shown that the syndicate's option from M. Blériot had expired before the company formed for the express purpose of exploiting it was in existence. The pundits preach economy nowadays and retrenchment in expenditure and luxuries. The possibility of cases of this nature being permitted to occur is surely one of the luxuries the nation can fitly dispense with.

Mile End

By the time these lines appear the Mile End election will be over. There is, therefore, scant need to return to the subject, save only to state that nothing that has occurred or been stated or written during the past week has caused me to alter the views which were fully set out in our last issue; rather the contrary. At this juncture, to attack a Government Department entrusted hitherto with a serious branch of our national defence, savours, to put it mildly, of political opportunism. Throughout our career we have carefully refrained from personalities, and will adhere strictly to this policy. We were unable to endorse Mr. Billing's candidature simply on the ground of his own published statements and the methods he has seen fit to adopt. Let there be no doubt on that score. Meanwhile his prospects were probably greatly enhanced by the two aeroplane

raids on the Kentish coast, though in point of fact these have little or nothing to do with the question of the defence of London.

The Aeroplane Raids on Kent

The long-expected has happened, and the Germans have sent three of their machines to drop bombs on the Kentish coast, though it is not known at the moment of writing whether they safely regained their base in Belgium. Probably they succeeded in doing this, for it is difficult to see how, save for some fortuitous occurrence, they could have been prevented from so doing. It should be made perfectly clear once and for all that there is no means known to prevent isolated aeroplane raids being made, and if we cannot prevent them, neither can the Germans. At the very same time that the second German raid was made by a couple of aeroplanes, a squadron of twenty-four French machines was bombing Metz. As I have always maintained, the wonder is not that the Germans occasionally succeed in dropping a few bombs on English soil, but that they do not do so more frequently. In this matter they have certainly shown a remarkable lack of enterprise, for Dover is only some sixty miles from Ostend, yet this is only the fourth time that the Germans have ventured to cross this strip of sea.

The Paddock of Our Dog

War is a strange revealer of character. Through the medium of the individual is a nation's heart laid bare. War has proved Tommy to be an incorrigible humourist. Three incidents in support of this reflection occur, unsought, to my mind. The first happened during the battle of the Marne, when the German howitzers first dropped their gentle dew upon our troops, and Thomas promptly and inexorably refused to be frightened—as he should have been, according to the book of modern German warfare—or run away, but irreverently dubbed these shells "Jack Johnsons" and "Coal-boxes." These pet names have no doubt been replaced long since by others, but the fact and its moral remain. For my second instance I have to allow eighteen months to elapse and to transfer the scene of action to the environs of Salonica. I quote a portion of an unusually human despatch which recently appeared in the no longer august columns of the *Times*:

A lorry of newly-arrived soldiers was proceeding to the front, and, turning a corner, nearly ran into a strangely garbed old patriarch of a white-bearded peasant driving two lumbering and unwilling buffaloes before him. It is impossible to say whether the old man or his almost hairless buffaloes most astonished the youths in the lorry—but there was no delay in the greeting. Leaning over the side a young soldier hailed the old man, "Ullo, old Noah," he cried, "so they've been and let you and them two blooming impossible old cows out of the Ark at last, 'ave they?" No naturalist with all the dead languages at his command ever found a better description of a Macedonian buffalo than a "blooming impossible old cow." It is exactly what it is.

And here is the third instance, which has the dual merit of being true and original. Somewhere close to one of our aeroplane stations in France there has been planted a signpost bearing the following inscription:

"PLEASE THIS IS THE PADDOCK OF
OUR DOG. THERE IS NOTHING
HERE TO TAKE OR TO DO IN."

As a succinct exposition of the national character that compilation is perfect. There is nothing to add. Its starkness is superb. The precise meaning and its local application—the context, so to speak—may escape us; but here, in one of those intermittent flashes of inspiration which seem to be peculiarly his own, an unsung soldier genius has summed up a whole period in our history. To the unknown author I beg to pay my humble tribute of admiration.

J. H. L.

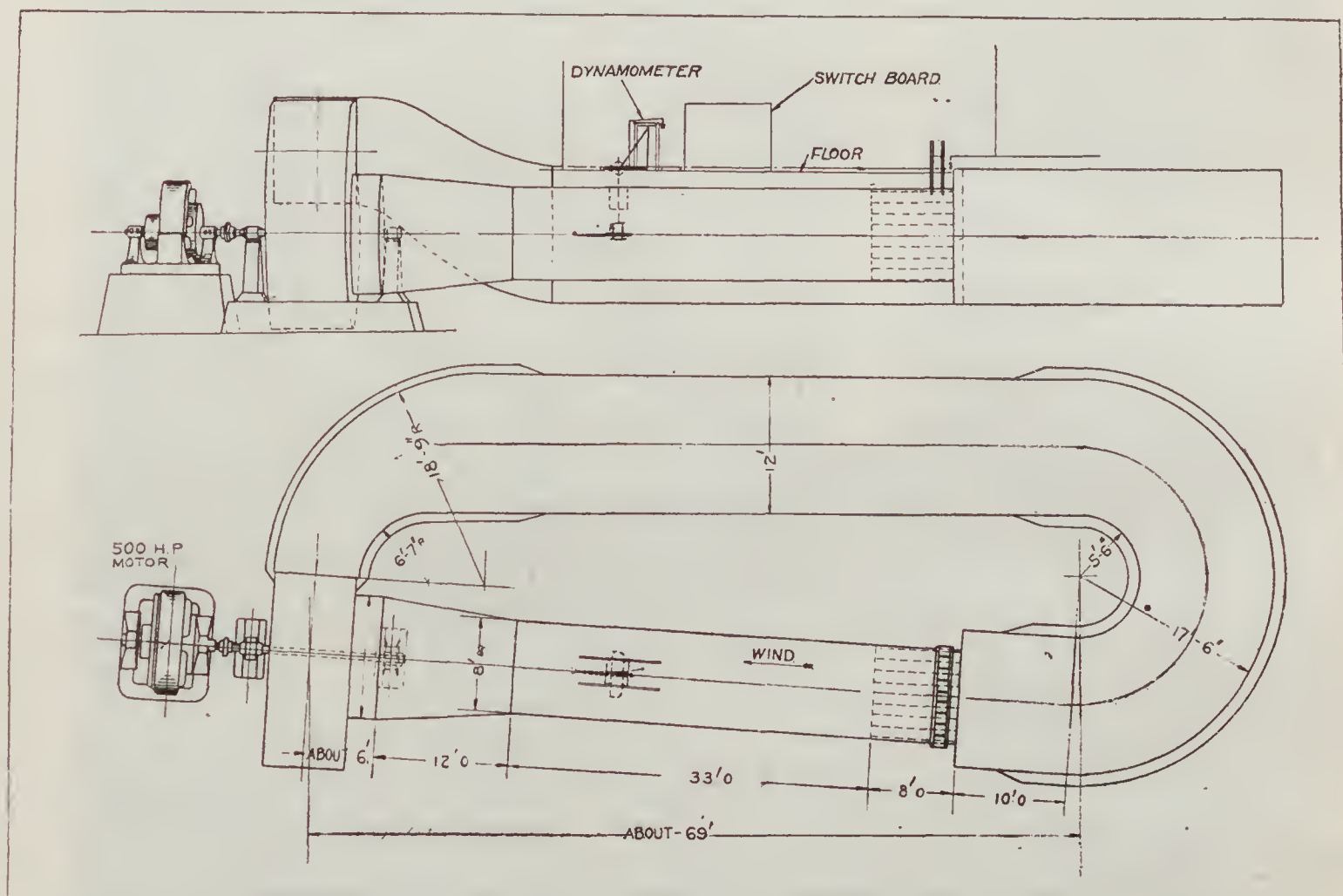
U.S. NAVAL EXPERIMENTAL WIND TUNNEL

THE large experimental wind tunnel which the Navy Department has established in the Washington Navy Yard, at the Experimental Model Basin, where warship models are tested, has now been in operation about a year. The tunnel is the largest in the world, having a section 8 ft. square at the point where the models are placed for testing. In addition to the advantage gained by the size, it is possible with the 500-horse power motor-driven fan to get wind speeds up to 75 miles an hour, which permits experiments being made at real flying speeds.

The tunnel consists of a closed circuit shaped like the link of a chain, as shown in the figure. The 500-horse power horizontal discharge fan of the corrugated paddle type, with an inlet diameter of 11 ft. 2 in., and a discharge duct 7 ft.

twelve pitot tubes, which lead to an integrating manometer, which gives the average velocity of discharge. This velocity has been calibrated against the velocity obtained at the section in the experimental chamber where the aeroplane or other model is placed, so that any desired velocity may be obtained at that point with precision without having any pitot tubes or obstructions other than the model being tested. In other words, by calibration the velocity of discharge may be found, and this bears a certain constant ratio to the velocity at the experimental section.

The velocities were determined by pitot tubes, which were checked with those used in the Aerodynamical Laboratory of the Massachusetts Institute of Technology and in the National Physical Laboratory in England.



6 in. by 9 ft., is placed at one end of the link. At the other end, where the air straightens out before flowing through the experimental chamber, are the baffles, which are necessary to remove the eddies and to control the uniformity of the speed. These baffles consist of sixty-four cells, each 1 ft. square and 8 ft. long. Each cell is provided with its own damper, so that the velocity of the air in any one section may be controlled. At the experimental chamber in the vicinity, where aeroplane wings or models are tested, the maximum variation from uniform flow is about 2 per cent.

The tunnel is built of wood, with frames spaced about 3 ft. on centres placed outside and sheathed on the inside with $\frac{3}{4}$ -in. tongued and grooved sheathing laid in two thicknesses in the direction of the air current, and with building paper placed between the two layers. The necessary curvature is obtained by bending the sheathing, the whole of which is blind-nailed.

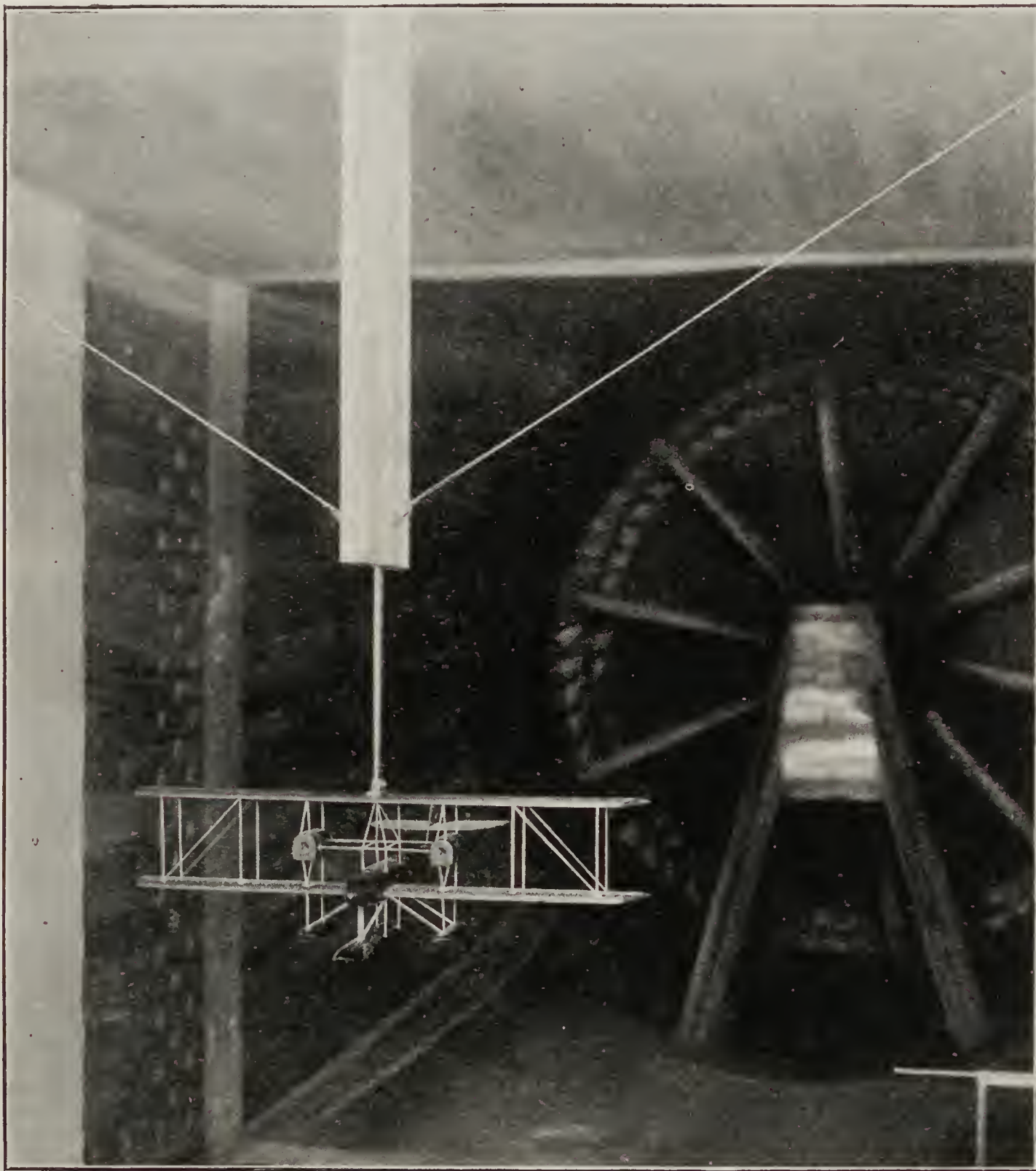
The fan is driven by a 250-volt, 500-horse power, direct current motor, arranged for operation on the Ward-Leonard System. The motor also has auxiliary field control, so that any desired speed up to about 200 r.p.m., which corresponds to a wind speed of 75 miles an hour, may be obtained. At the discharge side of the fan are located

Among recent investigations of interest made at the Wind Tunnel was the determination of the coefficient of air friction for various aeroplane and balloon fabrics. Tests have been made on the new dirigible building for the Navy Department and on models of Naval aeroplanes, both building and projected. A number of tests have also been made for private concerns. In carrying out experiments for private parties the same practice is followed as in the case of tests of ship models; that is, the actual cost of doing the work is charged in each case. On account of the large size of the tunnel it is possible to test comparatively large models of aeroplanes, with widths up to 36 in.

Appended is a photograph showing the arrangement of the model of an aeroplane when being tested. The model is carried by a steel spindle which extends up through the top of the tunnel to the weighing balance, which is placed overhead. For about two-thirds of the length of the tunnel the spindle is covered by a mask of stream-line form. This mask is secured to the ceiling of the tunnel and reduces the force acting on the spindle itself, and thus the spindle correction. The weighing balance consists of a weighing scale on the platform principle, having three axes, two of them at the same horizontal line 61 in. apart, and the third

vertically over one of the first, 48 in. above it. When a model is set at a given angle, the moments acting about each of these axes are measured by weighing them on the scale. With these data it is possible to compute horizontal and vertical components of the force acting on the model, that is, the drift and lift, and also to compute the line of application of the force. Tests are usually made at speeds of 40 miles an hour. At this speed and at the angle of least

such, for example, as the determination of the influence of form and dimensions on the size of ventilating cowls for use on ships. These tests have shown that it is not necessary to exceed certain dimensions, which are less than have heretofore been used in many cases. It is proposed shortly to obtain the wind resistance of a large battleship, this being an element of a ship's resistance which has not previously been accurately measured.



TESTING A MODEL AEROPLANE

resistance an ordinary aeroplane wing model has a horizontal resistance of something less than one-tenth of a pound. It is therefore necessary that the balance should be capable of weighing a force with accuracy to about 2/1000ths of a pound.

The large size of the tunnel makes it possible to test full-size radiators for aeroplane motors, and comparative tests have recently been made on several types, both as to air resistance and cooling capacity.

The Wind Tunnel has also been used for certain other tests which are not directly connected with aeronautics,

In conjunction with the Wind Tunnel, the Model Basin is used for determining the best form of floats for hydroplanes, and there will no doubt be many other cases where the data derived from tests made in the water may be applied directly to aeroplane design.

HYDROPLANE ALTITUDE RECORD

Lieutenant R. C. Saufley broke his former hydroplane altitude record (reported in our issue of January 5) on December 3, 1915, at Pensacola. He ascended to a height of 12,050 ft., in one hour, in a Curtiss model AH-15 hydroplane equipped with a Curtiss model "OX" 90 h.p. motor.

RANDOM REMARKS

XXXIV.—CLUBS. By ARTHUR LAWRENCE

Illustrated by ERNEST COFFIN

IT seems almost disgraceful to found a club or be a member of one when our men are being provided with clubs of another sort in the trenches. And yet the resort to such primitive weapons and the tendency for mortals to gather together are tendencies which have been handed down to us from time immemorial. In such times as these it seems to me peculiarly incumbent upon those who foregather in the comparative safety which our Navy and Army afford to indulge ourselves only in good humour and sociability, and to put aside that boisterous levity which may or may not have been in place in other days. Not that I would have him do the utmost he can to induce harmless mirth in his fellows. A prelate was once asked by his opponent at chess what he would do if they were interrupted by the Last Trump of the Day of Judgment. I think there was strong presumptive evidence of



"YOU ALLOW YOUR MIND TO WANDER"

mental equilibrium in his reply that he would do his best to finish the game. His occupation was innocent, and he felt no inclination to act as if it were otherwise.

I don't know that I have any particular title to write about clubs, but, then, if I waited until I had found a subject upon which my views were really worth having I should write not at all, and that would be a great loss—to me. I was a member of the Press Club for, I think, twelve years, the Savage for, I think, nine; I have been one of the National Liberal, have lunched and dined at most of the more expensive caravanserais, and so forth, but I think some of my pleasantest recollections are connected with a dining club called the New Vagabonds. It was during those cheery occasions, when I was young enough to enjoy everything to the uttermost, and finding new experiences every day, that I met

W. W. Jacobs and Phil May, H. G. Wells and many other good fellows. In the average club with its fixed place of abode the difficulty would seem to be as to the right line of exclusion. The pendulum is apt to swing too much to one side or the other. If severity is too much relaxed you are apt to let in a few bounders of the sort that tend to break up any society, and, if in your carefulness you become too severe there is the risk of the club being reduced to a collection of bores.

I am rather easily bored. Even in the privacy of my sanctum, with such a pleasant occupation as writing for AERONAUTICS to engage my wandering attentions, I have only to think of some of the people I've met and my mobile face loses itself in a yawn. The worst experience I ever had was at the hands, or the mouth, of a woman. She was a novelist. I had looked in to see Richard Le Gallienne and found his rooms prettily crowded. There were several folk there with whom I wanted to have five minutes' talk, but for some reason or other this vigorous literary lady made herself known to me and then carefully pinned me into a corner. She told me her entire life-story, or at least as much of it as she thought it right for me to know, and, after touching for half an hour or so on her parents went back to the peculiarities of her grandmother before my obvious mental paralysis brought some kind friend to the rescue. My back was literally to the wall all the time, and there was a large clock in the distance. For two awful hours that elderly damsel had spoken to me without one minute's pause. If there was any call for assent or dissent I had to content myself with moving my eyebrows, for I knew I was not allowed to open my mouth, and I could not summon up the slightest power of volition. It seemed to me as if, at the outset, like the wasp with the spider, she had paralysed me into helpless inertia, and nothing could have saved me except some outside force.

Of course, we all know the man with a big booming voice who meanders on with his platitudes or footling reminiscences until you feel you are about to suffer from concussion of the brain. Then there is the fellow who will tell you the plot of his next novel, and countless others of the same species. In such cases you allow your mind to wander and take its ease in some far-away clime, or otherwise you fear that something will crack at the base of your skull and you will be a tearful lunatic for the rest of your life. There are usually samples of bores in most clubs. The only thing is to have a sharp quarrel with them as an excuse for cutting them dead ever after. No mercy should be shown to the bore, for his peculiarity is the outcome of utter selfishness. The sound of his voice amuses him, and he doesn't care whether you sink or swim. It is the same creature who monopolises the fire. Whilst he reads one paper he sits on the others. One of them was approaching the club entrance one day when a complete brick fell on his head. Smiles went round, but he was only in bed for a week.

In club life, as I have known it, it is surprising how one or two men can leaven the lump. Given a man of wit and one who is always ready to enter the lists with all comers, and another, say, who knows how to "get up" the club house dinners, or entertainments, and you have pillars upon which the super-structure can rest. Among schoolboys one rotten youngster tends to poison the rest, but amongst adults the creature is rightly estimated and simply ignored. On the other hand, one or two right down cheery fellows of the right sort are welcomed and will make themselves felt throughout the atmosphere. Men are sad gossips, although never on lines of scandal, as readers of novelettes are led to suppose. I can put in some monkey-like chatter myself, but some months ago I was so completely outdone by one of my quite charming friends, that in sheer admiration I suggested that a coterie should be founded entitled "The Yaps," with himself as Head Yap. He accepted the office. The historian of a future date, when trying to trace back the growth of the Great Order, will be interested to know that we were but four on that occasion, although we soon added a few more to our number out of the thousands who applied to partake of our discourse.

Johnson's definition of a club is: "an assembly of good fellows, meeting under certain conditions." We are rather more than a club. We form an Order, with rites and ceremonies and penalties of the most awful and spell-binding description. Lucky indeed is the man who passes the tests and is branded with the hall-mark of our approval. Happy is the man and strange that the wife—if he have one—of so true a man can spare him for even one evening a week. May the day be far off when the Reaper shall claim one from our midst, but, when he does, his brothers of the Order will assemble with flowers in their coats and a toast to his manes, for it is the privilege of the Yaps to retain the cheery smile of warm-hearted philosophy and be masters of their souls through all tribulation. "To-day deep thoughts with me resolve to drench in mirth, which after no repenting draws," are the words of Milton which define the intent of our gatherings. In



"LUCKY IS THE MAN WHO PASSES THE TESTS"

such small but true beginnings have all the best clubs been founded. Lacking an early historian even the origin of their designation (such as the "Savage") have become debateable points, but the spirit of the founders still lives, and every good member has the proud privilege of carrying on the tradition.

THE FRENCH ATTACK ON THE FOKKERS

The correspondent of the *Morning Post*, writing on January 18, gives the following description by an eye-witness of the attack on the Fokkers reported in the French *communiqué* of January 11 (see our issue of January 19).

"Our warplanes, powerfully armed, belonged to a squadron commanded by Lieutenant F., who was previously in command of a flying school. On January 7 two of these machines, piloted by Corporal P. and Sergeant de G., went up to bombard certain objectives. Corporal P., his mission accomplished, was returning, when he observed a French Voisin machine attacked by a Fokker. The two aeroplanes were so close that it was difficult for the warplane to intervene without danger to the French aviator. However, it fired three shells in succession, at 1,500 yards, 1,000 yards, and 500 yards. The enemy's machine was not hit and it continued to gain on the Voisin. Then by an audacious manoeuvre Corporal P. dived down right on the Fokker and fired twice in quick succession. These projectiles found a target, and the Fokker burst into flames, while the German batteries opened a vain fire on the warplane, which landed uninjured behind the French lines.

"The second Fokker was brought down by Sergeant de G. Attacked by an enemy machine, that was very fast and attempted to reach him from below, the sergeant suddenly reduced his speed, and, forcing his aeroplane abruptly upwards, allowed the enemy to pass him below. The German pilot, seeing his danger, swerved to the right to escape the French aeroplane's gun, but

he was too late. The French pilot swept on him at full speed, and his machine gun opened fire at under fifty yards. A bullet pierced the petrol reservoir and the Fokker fell blazing into a forest. The French machine was planing towards the landing-place when another Fokker appeared in full chase. The enemy's machine-gun opened fire, and it was only by brilliant manoeuvring that Sergeant de G., who had no more ammunition, succeeded in escaping the onslaught."

AVIATION IN THE FRENCH PARLIAMENT

On January 18, M. René Besnard, Under-Secretary for Military Aviation, explained the Government's aviation programme to the Budget Committee. At the conclusion of the proceedings the following announcement was made:—"The Budget Committee, under the chairmanship of M. Klotz, after hearing M. Besnard, has duly noted the improvements contained in the proposed programme. M. Daniel-Vincent, Reporter on Aviation, was appointed to verify the statements made and to draw up a report which will be submitted to the Committee at an early date."

THE FRENCH AERIAL LEAGUE

The Executive Committee of the French Aerial League, recently appointed, consists of the following:—Hon. Presidents, MM. G. Clémenceau and L. Barthou; President, M. P. Doumer; Vice-Presidents, MM. Maurice Barrès and A. Lebrun; Secretary, M. H. Sabathiez; Members, MM. H. Bérenger, A. Capus, G. Eiffel, R. Péret, and S. Pichon.

PROGRESS OF AMERICAN AVIATION

By E. LARNE JONES, American Editor

CURTISS COMPANY SELLS OUT

WE will soon have the experience of watching the ticker for quotations on Curtiss aeroplane stock. The three Curtiss companies, the Curtiss Aeroplane Company, Curtiss Motor Company, and Curtiss Aeroplanes and Motors, Ltd., of Toronto, are shortly to be combined in a new concern to be called the Curtiss Aeroplane and Motor Corporation, capitalised at \$9,000,000 (£1,800,000). One-third in 6 per cent. notes maturing in instalments of \$1,000,000 (£200,000) in twelve, fifteen, and eighteen months, and \$6,000,000 (£1,200,000) 7 per cent. cumulative preferred stock make up the capital. \$3,000,000 (£600,000) is the consideration for the sale, in which Glenn H. Curtiss, Monroe Wheeler, and others share. Curtiss will be president of the new company. There will also be an issue of 150,000 shares of common stock without par value. It is

Imbrie and Co. state that no merger is contemplated with the new Wright company, which at the present time is not manufacturing any machines in quantities. Large interests are behind the Wright Company, and it was understood that the present suit against the Curtiss Aeroplane Company would be pushed. On the other hand, it is intimated that it is not likely these two new big companies will spend any great amount of money fighting patent suits.

William Morris Imbrie and Co., 61, Broadway, New York, is composed of William Morris Imbrie, James Imbrie, John K. Dodge, and William Gilman Low, jun. Mr. James Imbrie is an officer or director of a dozen railway, coal, iron, and traction companies, including Westinghouse, Church, Kerr and Co. William Morris Imbrie is interested in a fuel and water company, and Mr. Low, among others, is a director in the Home Life Insurance Company.



HOISTING AN AEROPLANE ABOARD A DESTROYER AT PENSACOLA
METHOD OF SALVING DAMAGED AEROPLANES AT SEA

understood the common stock will be offered as a bonus. The new company has not as yet been incorporated. All stock will be put in a voting trusteeship for a period of five years.

William Morris Imbrie and Co., a Stock Exchange brokerage house, is financing the new company, whose stock will be offered on the kerb when arrangements are completed. Price at which the issue will be offered has not been decided.

The capitalisation of the old company was \$3,000,000 (£600,000), and 1915 business is reported at \$5,000,000 (£1,000,000). Present contracts are said to amount to between \$13,000,000 and \$15,000,000 (£2,600,000 and £3,000,000), upon which it is expected a profit of \$6,000,000 or \$7,000,000 (£1,200,000 or £1,400,000) will be made.

CURTISS CO. GETS \$15,000,000 CONTRACT

THE Curtiss Aeroplane Co. has, it is reported, closed a contract for \$15,000,000 worth of aeroplanes.

In the fiscal year ended October 31 last the Curtiss Co. produced over \$6,000,000 worth of aeroplanes and motors.

On the year's business the company showed profits of \$2,500,000. In the current fiscal year to end October 31, 1916, profits are expected to be between \$7,000,000 and \$8,000,000.

At its Buffalo plant, which is said to be the largest aeroplane plant in the world, the company has in the past year been developing more efficient motors.

Prior to the war essential steel for construction of motors, etc., was secured abroad, and when the war cut off the German supply not a little difficulty was encountered in

securing American steel to fill the requirements. This difficulty has, however, been solved, and the Midvale and Driggs-Seabury companies are supplying a quality of steel that meets all tests of the foreign product. In fact, the only foreign material on the Curtiss aeroplane as now produced is the Irish linen which is used as wing covering.

It has been said that America has so far not been able to produce an efficient aeroplane motor or one that could comparably measure up with those manufactured abroad, but apparently Curtiss has developed a motor well up to the best of foreign makes.

THE WRIGHT SCHOOL AT AUGUSTA

THE establishment of the Wright Aviation School at Augusta, Georgia, was inaugurated under most favourable circumstances. The school opened there on December 20, 1915, with eighteen pupils, and Howard Rinehart, as chief aviator, and William B. Atwater as assistant.

By January 1, 1916, 1,261 minutes in actual flying had been given the pupils, and five of the pupils had successfully passed the test for their licence certificate, issued by the Aero Club of America. Those passing their licence tests were:—P. S. Kennedy, J. A. Shaw, L. Breadner, W. H. Chisam, and R. M. Weir.

After a long and exhaustive search of the South, Augusta was finally chosen by the Wright Company for the location of their School on account of its fine climate and weather conditions, and the excellent results obtained in the first fortnight there predict great possibilities for the future of the School. A sixty-mile gale was sweeping over the Eastern States for two days at Christmas-time, and, therefore, the showing made at the School was all the more remarkable.

Applications are coming in in such large numbers that it has been found necessary to enlarge the School in the proportion of one machine and one aviator to every ten pupils. Pupils will not only be given instruction on slow speed machines, but will also be given their last hour of the course (which consists of five hours) on a fast speed machine, which is an innovation in flying schools.

A PAN-AMERICAN AVIATION TROPHY

ENDORING the plan of Alberto Santos-Dumont, who has pointed out to the Second Pan-American Scientific Congress the fact that thousands of aeroplanes could be used to-day on this continent to solve difficult problems of transportation, and would form a valuable reserve which could be used in case of need to defend the nations of the Western Hemisphere, the Aero Club of America has offered a \$10,000 Pan-American Aviation Trophy, to be competed for between the representatives of the countries of the Western Hemisphere.

The trophy has been offered through the Brazilian Ambassador, who personally announced it to the representatives of the other countries of the Western Hemisphere assembled at the Second Pan-American Scientific Congress.

The Brazilian Ambassador and John Barrett, director of the Pan-American Union, have accepted the invitation, and will come to the tenth annual banquet of the Aero Club of America.

A committee composed of leading people, including representatives of all the countries of the Western Hemisphere, is being formed. This committee will outline a plan of action, which will then be carried out, and will make the rules for the Pan-American Trophy Competition. If it is decided that the competitors must be representatives of the aero clubs of the different Republics, then aero clubs will be formed in the Republics, and they will appoint the representatives, following the method adopted in the case of the Gordon-Bennett Trophy Competition.

MAKERS TO STANDARDISE?

HOWARD E. COFFIN, one of the foremost automobile designers in America, presided at the meeting of the Naval Advisory Committee held in the Engineering Building, 29, West Thirty-ninth Street, New York, the headquarters of the Aeronautical Society of America, on December 31. Representatives were present from half a dozen aeroplane manufacturers to discuss standardisation in aeronautics. Mr. Coffin felt that the Government would eventually demand something of this sort, and he wanted the manufacturers to be prepared themselves, after pointing out the great work of standardisation of the Society of Automobile Engineers, which revolutionised the automobile industry in this country, a committee, consisting of Howard Huntington, Elmer A. Sperry, Howard E. Coffin, and John E. Sloane, was appointed to list such parts as could be standardised and to report later. It was pointed out by the practical men present that aeroplane manufacturers were already using standard bolts, standard threads, cable, wire, tyres, wheels, rims, etc., and that little remained to be standardised. The Curtiss Company had no official representative present. Roy Knabenshue represented the Wright Company, in whose prospective movements other manufacturers' representatives seemed to take interest.

SOCIETY OF AERONAUTIC ENGINEERS

The first annual convention of the American Society of Aeronautic Engineers has been postponed until May, when an aero show will be held in New York and at the same time there will be an aviation meet at Sheepshead Bay. The change in date is due to the inability of manufacturers of aeroplanes and motors to prepare their exhibits by January.

TWO MARTIN AEROPLANES ACCEPTED

Acceptance tests of two Martin aeroplanes, fitted with Renault motors, have been under way the latter part of December at the Aviation School of the Signal Corps at San Diego. One of the four Martin hydro-aeroplanes is also under test. These are intended for Philippine service. Their span is 53 ft. and they are equipped with 125 h.p. 6-cylinder Hall-Scott motors.

A representative from Holland has been present and is interested in the tests, as he is in the market for several large hydros for his Government. Four officers of the Portuguese Army are taking instruction in flying.

During the week ending December 18, 1915, 98 flights were made at the Signal Corps Aviation School, of a total duration of 37 hours 26 minutes.

CURTISS COMPANY'S SCHOOL AT NEWPORT NEWS

The Curtiss Aeroplane Co. has selected Newport News, Va., as its winter headquarters for experimental work and training, and has made arrangements with the Atlantic Coast Aeronautical Station (a private company incorporated to carry on experimental work, and make Newport News an aeronautical centre) to use the latter's equipment. The Curtiss Co. will have three J. N. land machines of 90 h.p.; one Model 3, 160 h.p., of the type that Victor Carlstrom flew from Toronto to New York City; and four Model F 90 h.p. flying boats. The pilots of the land machines will be Victor Carlstrom and Bert Acosta, and of the water machines Walter Lees and Victor Vernon.

Very many natural or established conditions operated in favour of the selection of Newport News for the location of this important branch of the Curtiss work. First, the weather conditions are decidedly favourable. Its location on Hampton Roads gives a great expanse of quiet waters for experimental work and student flying. The great shipyards there make it a rendezvous for many men skilled in the mechanical sciences, and the city is within easy reach of both Washington and New York, as well as within flying distance of Florida.

Eventually there will be facilities at the Newport News training school for 500 pupils, with not more than four or five students to each machine. If necessary the Curtiss Co. will promptly send fifty machines to the winter station.

The land and the water schools will be operated together. All machines are to be equipped with either the Dep or the Curtiss controls, as the pupils may desire. It is the determination of the management to turn out efficient and capable operators in the shortest possible time. There are thirty pupils there now, most of whom are Canadians.

NEW COMPANIES

THE ERICK AEROPLANE MFG. CORP., Vernon Centre, N.Y.—\$100,000. Charles A. MacHenry, H. E. Papenberg, of New York, and Herbert C. Mason, of Vernon Centre. Vernon Centre is a hamlet west of Utica. None of these men are known in aeronautics at the present time.

AIRCRAFT IN ACTION

OFFICIAL INFORMATION

ENGLAND

January 19—Six Enemy Machines Brought Down—Raid on Le Sars—On January 17 sixteen of our aeroplanes attacked an enemy supply depot at Le Sars, north-east of Albert, causing considerable damage. During the day there were nineteen air encounters, in five of which enemy machines were driven down. Two of our aeroplanes were lost.

January 20—Two Enemy Machines Brought Down—One Lost—Yesterday (January 19) in the course of fourteen fights in the air, we drove two enemy machines down into the German lines. During the day we lost one aeroplane. An enemy aeroplane dropped three bombs into the outskirts of an unimportant village behind our lines.

January 23—Raids on Kent Coast—War Office announcements: 12.55 p.m. Taking advantage of the bright moonlight, a hostile aeroplane visited the East Coast of Kent at one o'clock this morning, and, after dropping nine bombs in rapid succession, made off seawards. No naval or military damage was done, but some damage was caused to private property, and an incendiary bomb caused fires, which, however, were extinguished by 2 a.m. It is regretted that, according to reports received, the following civilian casualties occurred: one man killed, two men, one woman, and three children slightly injured.

7.45 p.m. After the aerial attack upon the East Coast of Kent in the early hours of the morning, two hostile seaplanes made a second attack upon the same locality shortly after noon to-day. After coming under heavy fire the raiders disappeared, pursued by our naval and military machines. The enemy effected no damage. No casualties have been reported.

FRANCE

January 17—Attempted Raid on Dunkirk—Two enemy aeroplanes which were flying towards Dunkirk were bombarded by our special guns and were compelled to turn back. They dropped four bombs on the dunes without result.

January 18—Raid on Metz and Arnaville—During the night of the 18th two German air machines having dropped four bombs on Nancy, one of our air squadrons at once went up and bombarded the railway stations of Metz and Arnaville. Twenty-two bombs were thrown on the buildings, which were damaged.

January 20—Bombs on Luneville—An enemy aeroplane dropped three bombs on the outskirts of Lunéville, doing no damage. Another enemy machine had to land near Flin. The two officers manning it were made prisoners near Ogéviller, south-east of Lunéville.

January 21—Aviation in the French Chamber—On the demand of the Prime Minister the interpellations on the question of the aviation programme were adjourned sine die, pending the presentation of the reports of the Army and Budget Committees.

January 23—Raid on Metz—During Sunday (January 23) two of our aviation squadrons, representing a total of twenty-four machines, bombarded the railway station and the barracks at Metz; 130 bombs were dropped on the marks previously designated. The bombarding aeroplanes were escorted by two protecting squadrons, the pilots of which, on the way, fought ten actions with Fokkers and Aviatiks. Our machines, which were violently bombarded throughout their journey, returned safely, with the exception of one, which was obliged to land to the south-east of Metz.

ITALY

January 18—Enemy Aviators Put to Flight—Yesterday (January 17) some enemy aviators flew over the Lower Isonzo, but were everywhere put to flight by the fire of our anti-aircraft guns. One of our aviators bombarded Volano, in the Lagarina valley, where the headquarters of an Austrian force has been established.

January 20—Enemy Aeroplane over Udine—An enemy aeroplane appeared yesterday (January 19) over Udine. Driven off by the fire of our anti-aircraft guns it dropped two bombs from a great height, which fell in the suburbs of the town, but there were no victims and no damage.

January 22—Futile Raid on Dogna—An enemy aeroplane dropped bombs on Dogna (Altofella) without doing us the least damage.

RUSSIA

January 17—Air Raid on Dvinsk—German aeroplanes carried out raids over Shloek (west of Riga), Kurtenhof, and Dvinsk.

January 19—German Aerial Activity—On the Riga-Dvinsk front there were frequent flights by German aviators. Enemy aircraft appeared in the district of the lower course of the Aa in Courland, near Skotel, west of Friedrichstadt, and over Dvinsk, where the Germans dropped several bombs.

January 21—German Aeroplane Captured—Captive Balloon Exploded—Near the station of Vileika we captured a German aeroplane. To the north of Chartoryisk the enemy attempted to capture a hill which we occupied, but was repulsed. In the region north-west of Zbarash an enemy balloon exploded in the air and burst into flames. Its car fell in our lines.

DARDANELLES

January 16—Bombs on Enemy Ships—Turkish official: "Our seaplanes dropped bombs on enemy ships at Mudros."

BALKANS

January 17—German Attack on Kilindir—German official: "It is reported from Kambana that German aeroplanes bombarded the railway station of Kilindir, which had been occupied by the French. One benzine depot was destroyed by fire and two French aeroplanes were destroyed in aerial battle. The German aeroplanes returned undamaged."

GERMANY

January 18—Three Enemy Machines Brought Down—Two British aeroplanes came down in fights in the air near Passchendaele and Dadiscele (Flanders). Three of the four occupants were killed. A French aeroplane was shot down by one of our aviators near Moyenvic (in Lorraine, about nineteen miles north-east of Nancy). Both pilot and observer were captured.

January 19—German Attack on Tarnopol—A German air squadron attacked enemy storage depots and the aerial port at Tarnopol (in Galicia).

January 19—Raid on Metz—During the night (January 18) enemy aviators dropped bombs on Metz. An enemy aeroplane is reported to have come down, towards the morning, south-west of Thiaucourt, one of the occupants being killed. (See French Official and Other Sources.)

January 20—Two Enemy Machines Brought Down—Raid on Nancy—A British battle biplane, armed with two machine guns, was brought down by a German aeroplane from among a British air squadron. On the Yser the fire of our anti-aircraft guns forced an enemy aeroplane to land within the enemy's lines. The aeroplane was then destroyed by our artillery fire. Last night (January 19) we bombarded the military works at Nancy.

AUSTRIA

January 18—Raid on Ancona—On Monday afternoon (January 17) a squadron of seaplanes made a vigorous attack against Ancona, where the station, the electricity works, and barracks were hit by heavy bombs and set on fire. The very violent fire of four defence guns was quite unsuccessful and all the seaplanes returned safely.

January 21—Russian Air Raid behind Austrian Front—A Russian aerial squadron cruised over the sector south-east of Brzezany (fifteen to twenty miles behind the front) and dropped bombs without causing any damage.

FROM OTHER SOURCES

ENGLAND

January 17—Unequal Aerial Fight—The following account of a very lively aerial combat at Fricourt, in which one of our aeroplanes had been overpowered by several of the new Fokker battle planes which had ambushed it in a cloud-bank, has been gathered from eye-witnesses:

"The wounded British machine planed down behind our own lines, the hostile machines scurrying off when the anti-aerial guns opened upon them. The German artillery concentrated upon the spot where they thought the aeroplane had alighted, pouring in no fewer than 150 shells. The Boches, in their enthusiasm and excitement, rose breast high in their trenches, cheering the results of the unequal contest. The officer in command of the British artillery, divining that some such manifestation might follow, had rapidly given orders for every available gun to be laid upon the parapet of the German trenches, the range of which our batteries had registered to a nicety. How many of those heads vanished never to appear again we shall probably never learn, but the salvo must have exacted a deadly retribution for the success of the Fokkers."

January 19—British Airship over London—A British airship passed over North and South London yesterday morning (January 18) at a comparatively low altitude. The passage of the airship was watched by large crowds.

[The "airship" in question happened to be a balloon.—ED.]

January 19—German Munition Stores Bombed—The *Telegraaf* learns to-day (January 19) from Belgium that three Allied aviators successfully bombarded German munition stores on the Franco-Belgian frontier.

January 20—The Magazine Explosion at Lille—Herr Karl Rosner, war correspondent of the *Lokalanzeiger*, has sent a description of the results of the explosion at the German ammunition store at Lille which was mentioned in the German communiqué of January 12. He was staying at an hotel at Lille which was partly occupied by the German Army Staff. He states: "One cried, 'An English aviator has hit the ammunition depot'; another, 'It was an Englishman who did it.'"

January 21—The Success of the Fokker—Reuter's Special Correspondent at the British Headquarters in France writes:

"Berlin is very jubilant over the recent successes of the German aviators along the Western front. The new Fokker battle-plane is unquestionably a most effective machine and (usually in greatly superior numbers) these aircraft have latterly accounted for several of our own. The great feature of the Fokker is the mounting of a machine-gun in such a manner that it can be fired horizontally, clear of the propeller, thus enabling successful attack to be made against

a hostile plane. But here again the momentary advantage (if it can really even be so called) is one of means and not of men. Our own flying men are unanimously optimistic. They know that what the Germans can do in this way it is not denied to us to be able to accomplish, and that some very considerable overhead surprises are rapidly approaching the stage of materialising. Furthermore, the difference between the daring spirit of our men and the caution of the enemy must be borne in mind in considering the true significance of the recent successes of the latter. For every one German machine that ventures to cross our lines ten British planes may be seen wheeling over the enemy positions. And this not once in a way, but almost any day when the weather is fit for flying. So that the average German chances of shooting down an aircraft stand in the ratio of ten to one against ours."

FRANCE

January 17—Two German Machines over Chalons—Taking advantage of the fine weather, two German machines flew over Chalons, but were driven off by anti-aircraft fire before they had dropped any bombs.

January 20—American Aviators for France—The *Petit Journal* says that four American aviators have landed in France to proceed to the front. Called upon to make a written declaration regarding the object of their journey to Europe, the Americans stated that they were going in order to protest on behalf of the young men of America against the policy of weakness of their country.

January 22—Two Aviators Killed—This afternoon (January 22) an aviation accident occurred at the aerodrome of Bron. An officer and a soldier were killed.

RUSSIA

January 19—Aerial Activity on the Riga-Dvinsk Front—During the warmer interval of a couple of weeks on the Riga-Dvinsk front the Germans showed a certain liveliness, in particular in aeroplane scouting.

DARDANELLES

January 19—Turkish Aerial Reconnaissance—From an account of the evacuation of the Gallipoli peninsula: "The Turks were necessarily well aware that the evacuation of Cape Helles by the British was a likely contingency, and that if we did it at all we should do it soon. Their aeroplanes, sometimes in twos and threes, hung over our position at all times of the day, flying much lower than usual, and obstinately refusing to be driven away by gunfire."

ITALY

January 18—Bombs on Ancona—Five enemy aeroplanes flew over Ancona yesterday (January 17) and dropped bombs. One person was killed. (See Austrian Official)

January 20—Austrian Machine Captured—The Vienna report that after the last raid on Ancona (January 18) all the Austrian aeroplanes returned safely is denied in a semi-official statement from Rome, which says that one machine "L 59" was destroyed and its occupants, Naval Ensign Alexander Ulmanský and Sub-Lieutenant Karl Kubasek, of the Corps of Naval Constructors, made prisoners.

BALKANS

January 14—Visits of Russian Aeroplanes—The correspondent of the *Morning Post*, writing from Budapest, states: "Almost every day Russian aeroplanes appear over Czernowitz, throwing bombs, but the public is quite accustomed to these visitors, and in spite of the order that in case of aerial attacks everyone should seek shelter, the people always flock into the streets, enjoying the fun."

January 17—Bombardment of Bulgarian camp—The bombardment of the Bulgarian camp at Petrich by a French squadron of twenty-six aeroplanes caused a good deal of damage. A considerable number of soldiers are said to have been killed or wounded. A Bulgarian aeroplane threw bombs on Gumendji, but no harm was done.

January 18—Aeroplane's Plunge into the Sea—An enemy aeroplane which for several days has been trying to reconnoitre our positions on the eastern flank, near the Gulf of Orfanos, met with a sudden end at 10.30 last Wednesday morning (January 12). Laying a course across the gulf towards the Bulgarian frontier, it met a squall and at the same moment had engine trouble. In full view of a British cruiser it dived towards the sea, at first evenly, then turning over and over. One of its two aviators fell before it hit the water; the other sank with the machine in a choppy sea.

January 21—The Shelling of Dedeagatch—Further details are now known about the bombardment of Dedeagatch and Porto Lagos. It was both well placed and executed. Its objective was the destruction of the main railway line passing north of Dedeagatch, and was carried out with the assistance of seaplanes, which directed the fire of the heavy guns of the ships. Apart from the observations of the aeroplanes, the information received from over the border agrees that the damage done was considerable. The seaplanes pushed inland to Xanthi, where their appearance caused a panic among the population.

HOLLAND

January 18—German Aviators Released—Two German aviators who were picked up a few days ago by a boat from the Noordhinder Lightship have received permission to return to Germany.

GERMANY

January 18—Demand for Compensation by Air Raid Victims—The German towns in the south which have suffered from air raids are already clamouring for compensation. According to the *Frankfurter Zeitung*, Mannheim, Karlsruhe, Offenburg, Freiburg, Lörrach, Mülheim, and Donaueschingen have sent a joint appeal to the Government to include in the impending German Compensation Bill compensation for personal injuries, and they ask for advances to be made to injured persons and their dependents.

January 18—Two Zeppelins Reported Wrecked—A Maestricht newspaper is informed that on Tuesday last (January 11) two Zeppelins were hit by French artillery fire north of Reims, and fell to earth in Belgium. The wreckage, it is added, has been sent to Germany.

The above report is issued by the Central News with reserve. Unconfirmed reports of disasters to German airships have been repeatedly circulated through neutral channels lately. No mention of the presence of Zeppelins "north of Reims" was contained in any of the French communiqués last week.

January 19—Ten Children Killed by an Air Bomb—Ten children have been killed by an aeroplane bomb explosion at Cologne. The youngsters were playing in a ditch near the flying ground when they unearthed the bomb from a rubbish heap.

January 20—German Aviator Killed—According to the *Mainzer Tageblatt* a fatal aviation accident occurred at Consenheim, near Mainz. An aeroplane dashed down to the ground, and the occupants, Lieutenant Schröder and non-commissioned Officer Zimmermann, were severely burnt, the former with fatal effects.

January 20—Zeppelin off Norway—A telegram from Narvik says that Captain Bergfjord, of the steamer Ofoten, on arriving at that port, stated that yesterday afternoon (January 19) at five o'clock he observed a Zeppelin at a height of about 500 metres. Apparently the airship was signalling, for she showed red, green, and blue lights. Soon afterwards she disappeared, travelling in a south-westerly direction.

AUSTRIA

January 21—Austrian Aviators Captured—A telegram from Venice announces that a British submarine has captured two Austrian aviators whose seaplane had fallen into the water near Grado. An Austrian destroyer which arrived on the scene while the aviators were being taken on board was torpedoed by the submarine.

STATEMENTS IN PARLIAMENT

HOUSE OF COMMONS

January 17—Dope Poisoning (Oral Answers)—Mr. Rowlands asked the Secretary of State for the Home Department whether the new and improved buildings have been completed at the works where Charles Selwood lost his life by dope poisoning last December; whether the Home Office has had any more reports of the evil effects of dope from any of the works where it is being used; and is the Department carrying on any experiments to ascertain whether as good results can be obtained from material of a less dangerous character?

The Under-Secretary of State for the Home Department (Mr. Brace): The new building is being pressed forward, but it is on an extensive scale and cannot be completed for several weeks. Meanwhile the firm are doing all they can by administrative measures, including strict medical supervision and intermission of employment, to lessen the risk. Reports of mischief, in one case fatal, have been received from three other factories, and the cases are under investigation. The question whether other materials would give equally satisfactory results is a practical one which can only be determined by the two Departments concerned. The War Office are already using a non-poisonous dope in one factory, and the Admiralty have been making experiments of which the Home Office has not yet heard the results. A further conference has been arranged between the Departments for this week.

Mr. Rowlands: Cannot this work be carried on more speedily on account of the danger, and will the Home Office adopt the course recommended at the inquest on Selwood, that the men or the women should not be continuously employed on this work, and should be periodically examined by a medical man?

Mr. Brace: I can assure my hon. friend that the Home Office is doing all it can, and is pressing the matter forward. What my hon. friend has said I will report to my right hon. friend, and see if any further pressure can be put upon the Department concerned.

January 19—London Anti-Aircraft Defences—Mr. Tennant, in reply to Sir J. D. Rees (Nottingham, E., U.), said: The London anti-aircraft defences are still under the control of the Admiralty. It is not desirable in the public interest to make any further statement at present.

January 20—The Air Defences of London—Mr. E. Cecil (Aston Manor, U.) asked the Prime Minister whether the anti-aircraft defences of London and elsewhere were continuing to receive the close attention of His Majesty's Government; and whether he could discreetly disclose any information on the subject to reassure the public in this respect.

Mr. Asquith (Fife, E.): The answer to the first part of the question is in the affirmative. As regards the second part, certain changes are under consideration. It would not be in accordance with the public interest to make any statement at present.

Blériot Manufacturing Aircraft Co.—Mr. Annan Bryce (Inverness Burghs, L.) asked the Chancellor of the Exchequer whether he was aware that the sanction of the Treasury Committee on New Issues was given to the Blériot Manufacturing Aircraft Co., promoted by Mr. Harry Lawson, of which the Duke of Manchester was chairman, and against which a petition for compulsory winding-up had already been granted; would he say on what principle the Committee's sanction was given; and whether, when the sanction was given, the Blériot machine had ceased to be purchased by the Government.

The Fokker Aeroplane—Mr. Tennant, asked by Sir E. Cornwall whether the British aeroplanes now at the front were equal in efficiency to the new German Fokker machines, and whether he could make any statement as to the results of the aerial fighting on the British front in Flanders during the last month, said: In order that the present position as regards aerial fighting on the Western front may be correctly understood the defensive nature of the German methods of fighting in the air must be kept in mind. It is to this kind of fighting only that the Fokker aeroplane, which is incapable of prolonged flights away from its own lines and over the British lines, is appropriate, though for this limited purpose its suitability is not disputed. The main duties of aeroplanes, however, are reconnaissance and artillery work, and, in our case, offensive fighting, and it is with reference to these duties that the suitability of our types of machine must be judged mainly. I may say, however, that if the Germans adopted the offensive and came behind our lines we have machines quite equal in efficiency and speed to the Fokker aeroplanes which they employ defensively behind their lines.

In reply to the second part of the question, I would point out that, for the reasons I have mentioned, nearly every fight in the air takes place on the German side of the trenches. (Cheers.) As a result, casualties to our aeroplanes and pilots, when they occur, tend to appear excessive by comparison, because the Germans can hide their own whilst advertising ours. But my military advisers are satisfied that our Flying Service has given a good account of itself in recent fighting. (Cheers.)

BRITISH AVIATORS AND THE FOKKER

British Headquarters, January 22.

The Fokker is a first-class engine of war, but it is hardly fair to British inventive talent and to the audacity of British flying men to come to the easy conclusion that, being such an engine, we cannot deal with it. We can, and do. It is easy enough to demonstrate that we do, but the means by which it is done, the sort of information that would give still greater assurance at home, cannot be passed on, because the German flying corps, it is possible, would be just as interested as British civilians.

The Fokker is a predatory bird which made a sudden appearance on our front. It is a small machine, but it is wonderfully swift, assured in its flight, and its gun can be fired through its revolving propeller blades. Among scouts on reconnaissance work it is something like a peregrine falcon to the herons. But its radius of action is limited. And there is one very good reason why the Germans are enabled at times to report with such assurance the destruction of British aeroplanes: but it is not, when known, the best of testimony of their air work. The men in our trenches see going over them daily into the enemy's country our aircraft, on their way to bomb, to spy for our artillery, to look for enemy movements, and to photograph the enemy's works. The German visits into our region are infrequent. The enemy's flying men may not be less courageous; the point is they do not often come. The fighting Fokker keeps to its own side and waits for our men. If it brings a British machine down, then our plane falls where the Germans can be quite sure they have got it.

But the British aviators have a fighting machine too, which is not at all alarmed by the appearance of a Fokker; it makes at once in that direction with quite excellent results at times. But the dead Fokker always lies in German territory, where we cannot definitely count it in our bag. Our own fighting machine, like the Fokker, can direct dead ahead the burst from its drum of bullets. I should like to describe it, but may only say it has quite admirable qualities. The German machines which have to meet it have developed a very healthy respect for it, and with reason, as our air reports show.

A British pilot, while on a recent expedition, was attacked by a Fokker from behind. He tried to elude it, but found the German had the speed, so turned to meet him. A combat took place without a score, and while our man was fitting another drum to his gun the German approached within 50 yards. Our man expedited his job, got in a few shots, and the Fokker went down vertically, turning over and over. Another Fokker flew at him, whereupon the Englishman dived, turned, and let go the remainder of his drum. The second German then understudied the act of the first. The British machine was damaged, but its pilot got it safely within the British lines.

And one of our pilots claims a bag of three Fokkers and possibly an Albatross in one day. Our man was in a fighting machine escorting a scouting plane when, 2,000 ft. above the scout and behind it, the pilot in the fighter observed two Fokkers. He

dived for them and dropped one, the Fokker nose diving for 6,000 ft. In the meantime the second Fokker had climbed above and behind the British machine, which turned and climbed also, got within 100 ft. of the enemy, and sent him hurtling earthwards. The British plane then ascended to 10,500 ft., and saw the Albatross following the scout, but at a greater altitude. Our plane climbed for it, reached it, and fired into it, the German descending rapidly into the murk of a forest below. Returning to his own lines, our pilot saw yet another Fokker, working among a little flock of our scouts like a hawk. When firing within 70-ft. range, the German was seen to be struck, and the Fokker at that instant nose dived, and when last seen was 3,000 ft. below still going to earth at a very steep angle.

DEATH OF MISS TREHAWKE DAVIES

The death is now announced of Miss Trehawke Davies. She was well known as passenger of the late Gustav Hamel and Astley, and of Captain Valentine and other pilots. Her death occurred suddenly in London towards the end of November, but was not then made public, in accordance with her expressed wish.

Miss Davies enjoyed the distinction of being the first woman to cross the Channel. It was in April, 1912, that she achieved this record by accompanying Hamel in a successful flight from Hendon to Paris.

Before her death Miss Davies presented her monoplane to the Royal Navy for use by the Naval Air Service. She was the daughter of the late Mr. F. Trehawke Davies, formerly a member of the Marylebone Borough Council.

HONOURS FOR THE ROYAL FLYING CORPS

The *London Gazette* of January 22 announced the following:—

DISTINGUISHED SERVICE ORDER

Capt. Malcolm McBean Bell-Irving, Royal Flying Corps (Special Reserve).

For conspicuous and consistent gallantry and skill during a period of nine months in France, notably on December 19, 1915, between Lille and Ypres, when he successfully engaged three hostile machines. The first he drove off, the second he sent to the ground in flames, and the third nose-dived and disappeared. He was then attacked by three other hostile machines from above, but he flew off towards Ypres, and chased a machine he saw in that direction. He overhauled it and had got to within a hundred yards when he was wounded by a shell and had to return.

MILITARY CROSS

Lieut. (temporary Capt.) George Lockhart Piercy Henderson, Royal Flying Corps (Special Reserve).

For conspicuous gallantry and skill. On November 28, 1915, between La Bassée and Lille, after he had driven down one Albatross, he attacked two other hostile machines, and, in spite of heavy fire, put them both to flight. Then under anti-aircraft fire he chased two more machines and drove them off. On December 2, near Don, when on escort to a bombing expedition, he was hit by a bullet in the head in a fight with a German machine. Though partially stunned and half blinded he succeeded in bringing his own machine back to his aerodrome.

Second Lieut. (temporary Capt.) William Douglas Stock Sanday, Royal Flying Corps (Special Reserve).

For conspicuous gallantry and skill near Hulluch on January 1, 1916. He went out in a very high wind to observe the fire of a battery, and, owing to the clouds, was forced to fly at a height of between 800 and 900 feet. Although continually subjected to very heavy rifle fire from the German trenches, he enabled our battery to obtain several direct hits.

DISTINGUISHED CONDUCT MEDAL

Donald, 3022 First Class Air Mechanic T. H., Royal Flying Corps (near Achiet in France).

First Class Air Mechanic T. H. Donald, Royal Flying Corps, distinguished himself by very great skill as a gunner during an air fight in France on November 7. When he was on patrol in a Vickers fighting machine, with Lieut. Insall as pilot, a German machine was sighted, pursued, and attacked near Achiet. The enemy machine was brought down by his fire and burnt on the ground by an incendiary bomb, while at least one of its crew was wounded. Our own machine was damaged, and forced to alight 500 yards inside our lines, where it was heavily shelled on the ground. It was, however, repaired during the night and flown safely home at dawn.

The following officers of the R.F.C. were omitted from the list of Honours published in our issue of January 19:—

DISTINGUISHED SERVICE ORDER

Capt. Henry le Marchant Brock, Royal Warwickshire Regt. and R.F.C.

Capt. John Glanville Hearson, R.E. and R.F.C.

MILITARY CROSS

Capt. James Lee Jackson, Connaught Rangers (Special Reserve) and R.F.C.

Capt. (temporary Major) Edgar Rainey Ludlow-Hewitt, Royal Irish Rifles and R.F.C.

Capt. Henry Petre, Australian Force, Aeroplane Section.
Second Lieut. (temporary Lieut.) R. A. Saunders, R.A. (T.F.)
and R.F.C.

HONOURS FOR THE R.N.A.S.

DISTINGUISHED SERVICE CROSS

A supplement to the *London Gazette*, issued on January 21, announced that the King had been graciously pleased to give orders for the award of the Distinguished Service Cross to the undermentioned officer in recognition of his services during the advance on Kut-el-Amara on September 27 and 28, 1915:—
Flight-Lieutenant Vivian Gaskell Blackburn, R.N.

Flight-Lieutenant Blackburn did excellent air reconnaissance work, and came under heavy fire on the afternoon of September 28, whilst carrying despatches between the General Officer Commanding and the *Comet*.

CASUALTIES

ROYAL NAVAL AIR SERVICE

KILLED

January 17

Northcott, Lieut. H. H. M., R.N.

The following notice appeared in the obituary columns:—

“Northcott—On January 17, killed on duty while flying, Henry Hans Macfarlane Northcott, Lieut. R.N.A.S., the beloved eldest son of William Henry and Louisa Mary Northcott, of 6, Earl's Court Square, S.W.”

Mr. C. P. Harris, Coroner for North-East Kent, held an inquest on January 19 on the body of the above officer, who was thirty-one years of age, and was killed while flying as a passenger with Flight Sub-Lieut. L. A. T. Pritchard, R.N. It was stated that the weather was calm and misty, but the biplane, in descending, had a side-slip, and a slight puff of wind catching one of the planes, the machine fell to the ground from a height of between 30 and 40 ft. Lieut. Pritchard was only slightly injured, but Lieut. Northcott, who was pinned beneath the engine, died shortly after from fracture of the base of the skull. It was Lieut. Northcott's first flight.

Undated

Boles, Lieut. N. H., 2nd Dorset Regt., attached Royal Naval Air Service.

SLIGHTLY INJURED

January 17

Pritchard, Flight Sub-Lieut. Lorenzo A. T., R.N.

January 20

Darley, Flight Sub-Lieut. Cecil H., R.N.

January 17

Second Class Air Mechanic C. E. Beard, R.N.A.S.

At the inquest held at Westminster on January 21 on the above mechanic, it was stated by Edward Brookes, mechanic in the R.N.A.S., that he, Beard, and others were in a motor lorry laden with tubes of hydrogen for balloons weighing about four tons. They were proceeding along the Embankment at about four miles an hour, and when near Cleopatra's Needle the rear of the lorry swerved and came into collision with a lamp standard. The base of the standard was not broken, but the top snapped off and fell on to the lorry, killing Beard outright, and injuring witness and five other men. In returning a verdict of accidental death the jury exonerated the driver from blame.

ROYAL FLYING CORPS

January 15

WOUNDED

Denne, Second Lieut. R. A., Wilts Regt. and Royal Flying Corps.

Erskine, Capt. R., 7th Royal Scots Fusiliers and Royal Flying Corps.

Herring, Second Lieut. J. H., Royal Flying Corps.

Milling, Lieut. H. B., Motor Machine Gun Service, attached Royal Flying Corps.

Undated

Beatson, Lieut. C. G., 5th Middlesex Regt., attached Royal Flying Corps.

Bowen, Lieut. E. G. A., R.A., attached Royal Flying Corps.

Grey-Edwards, Second Lieut. H. B. R., R.A., attached Royal Flying Corps.

Marburg, Second Lieut. T., Royal Flying Corps.

Welch, Second Lieut. S. T., Royal Flying Corps.

EXPEDITIONARY FORCE—INDIAN FORCES

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED

Cunningham Reid, Second Lieut. D. F., attached R.F.C.

PREVIOUSLY OFFICIALLY REPORTED MISSING, NOW UNOFFICIALLY REPORTED KILLED

Yule, Second Lieut. L. W., R.F.C.

(A notice of Second Lieut. Yule's death appeared in our issue of January 12)

Hobbs, Second Lieut. A. V., R.F.C.

Second Lieut. Alan Victor Hobbs, R.F.C., “missing, unofficially reported killed,” was the eldest son of Mr.

A. E. Hobbs, Tunbridge Wells, and was twenty-one years of age. Educated at Skinners' School, Tunbridge Wells, at Tonbridge School, and at St. John's College, Cambridge, he had completed one year's residence there and successfully passed the first part of the mathematics tripos when war broke out. In October, 1914, he was gazetted temporary second lieutenant in the 10th Battalion Royal Sussex Regiment, and was sent at the end of January of last year to Shoreham and Gosport for training in the Royal Flying Corps. He went to France as pilot in July, and served successfully there till his machine was shot down over the German lines on December 15.

Tudor-Jones, Second Lieut. C. E. T., E. Lancashire Regt. and R.F.C.

Smith, Second Lieut. N. G., Highland Light Infantry and Royal Flying Corps.

Second Lieut. Alastair Ross, R.F.C., was killed on January 17. It was fine and calm when he ascended in his biplane, and flew gently away in a southerly direction. Lieut. Ross had reached a good height when it was seen that he had lost control of his machine, which came rapidly to the ground. The biplane immediately burst into flames, and all that could be seen when the fire was subdued were the charred remains of Lieut. Ross's body. At the inquest on January 18 it was stated that he was killed during his first flight alone. He was a native of Aberdeen, aged twenty-seven, and had just returned from Canada. The machine came down nose first from a height of 250 ft. There was a loud explosion, and a sheet of flame rose up 40 ft. In the doctor's opinion the airman was dead before the fire took place. A verdict of accidental death was returned.

MISSING

January 11

Adams, Second Lieut. F., R.F.C.

McEwen, Second Lieut. J. G., R.F.C.

January 14

Gray, Lieut. K. W., Wilts Regt., attached R.F.C.

Hathaway, Second Lieut. S., R.F.C.

Kemp, Second Lieut. H. T., Cheshire Regt. and R.F.C.

Kingdon, Second Lieut. L., Worcestershire Regt. and R.F.C.

January 18

Barton, Second Lieut. R., R.F.C.

Cobbold, Lieut. E. F. W., 7th Cheshire Regt. (T.F.) and R.F.C.

Wilkinson, Lieut. E. S., 1st London Regt. (T.F.) (R. Fusiliers) and R.F.C.

Undated

Field, Lieut. C. V. G., 4th Canadian Infantry Bn. (Central Ontario Regt.), attached R.F.C.

APPOINTMENTS

ROYAL NAVAL AIR SERVICE

Acting Wing Commander Frederick C. Halahan, M.V.O., has been confirmed in the rank of Wing Commander: May 6, 1915.

Acting Wing Commander:

F. C. Halahan, M.V.O., confirmed in rank of Wing Commander, with original seniority.

Engineer Lieut. (R.N.):

J. S. Machan, to the *President*, additional, for R.N.A.S.: January 28.

Midshipman (R.N.):

A. R. T. Pison, allowed to withdraw from the Royal Navy (January 19), and appointed as Probationary Flight Sub-Lieut., with seniority of January 20, and appointed to the *President*, additional, for R.N.A.S.

The undermentioned have been entered as Flight Sub-Lieuts. for temporary service on probation, with seniority as follows, and all appointed to the “*President*,” additional, for R.N.A.S.:

B. D. Hobbs: December 27.

E. S. Boynton, A. J. Chadwick, and F. S. Mills: December 30.

A. E. Harding: January 19.

Chief Petty Officer W. James and Petty Officer E. E. Barratt both promoted to the rank of Flight Sub-Lieut., for temporary service, on probation, with seniority of January 15.

Messrs. H. H. James and W. B. Chippendale, both as Warrant Officer (Second Grade), with seniority of January 24, and appointed to the *President*, additional, for R.N.A.S.

Male (E):

W. E. French, to the *President*, additional, for R.N.A.S.: January 18.

ROYAL FLYING CORPS

The following appointments are made:—

Squadron Commander:

Capt. P. K. Wise, Royal Warwickshire Regt., from a Flight Commander, and to be temporary Major whilst so employed: December 31.

Squadron Commanders, from Equipment Officers, and to be temporary Majors whilst so employed:

Capt. R. C. Donaldson-Hudson, T.F. Reserve, and Capt. A. Huggins, Special Reserve: December 15, 1915.

Wing Adjutant:

Capt. Victor H. Secker, 14th (King's) Hussars, and to be seconded: January 15, 1916.

Flight Commander:

Capt. P. K. Wise, Royal Warwickshire Regt., from a Balloon Officer: December 18.

Flight Commanders from Flying Officers:

Lieut. A. H. Morton, R.A., and to be temporary Capt. whilst so employed: January 7.

Capt. C. T. Maclean, Royal Fusiliers, Special Reserve, and Temporary Lieut. S. G. Gilmour, General List, and to be temporary Capt. whilst so employed: January 8.

Flight Commanders (from Flying Officers, and to be temporary Capts. whilst so employed):

Temporary Second Lieut. C. S. Wynne-Horton, General List: December 30.

Temporary Second Lieut. J. C. Quinnell, R.A., and Second Lieut. H. A. Cooper, Special Reserve: January 1.

Flying Officers:

Lieut. J. B. Elliott, Rifle Brigade, Special Reserve, and to be seconded; Lieut. R. N. Adams, Royal Fusiliers, Special Reserve, and to be seconded; Second Lieut. (temporary Lieut.) C. I. Burrell, R.E., Territorial Force; Second Lieut. (temporary Lieut.) A. F. K. White, Suffolk Regt, Territorial Force; temporary Second Lieut. G. S. Bush, Somerset L. I., and to be transferred to the General List: December 23.

Second Lieuts., Special Reserve: A. Lang and A. Goodfellow: December 23.

F. J. H. Thayre, T. C. Wilson, and R. K. Shivas: December 29.

R. A. Logan and Second Lieut. M. A. A. Lillis, Royal Irish Rifles, and to be seconded: December 30.

Temporary Second Lieut. M. G. P. Phillips, Prince of Wales's Vols. (South Lancashire Regt.), and to be transferred to the General List; Second Lieut. O. Lerwill, Special Reserve; Second Lieut. L. C. Kidd, Special Reserve: January 4, 1916.

Temporary Lieut. Hon. Wilfrid C. W. Egerton, General List, to be temporary Capt. whilst employed as Assistant to the Officer in Charge of R.F.C. Records: September 23, 1915.

Temporary Second Lieut. H. Hemming, General List: December 14.

Temporary Second Lieut. A. R. Johnston, Highland Light Infantry, and to be transferred to General List; Temporary Second Lieut. J. T. Kymn, 12th Reserve Regt. of Cavalry, and to be transferred to General List; Lieut. D. C. Rutter, Royal Sussex Regt., Special Reserve, and to be seconded; Second Lieut. E. Robinson, R.A., and to be seconded: December 16.

Second Lieut. E. M. Gilbert, Essex Regt., Special Reserve, and to be seconded: December 18.

Lieut. W. S. F. Johnson, Leicestershire Yeomanry T.F.; Temporary Lieut. C. E. Sherwin, Hampshire Fortress Engineers, T.F.; Temporary Lieut. H. O. Long, R.E.; Second Lieut. S. E. Pither, King's Own Scottish Borderers, and to be seconded: December 19.

Temporary Second Lieut. H. A. Tweedie, attached 10th Hussars, and to be transferred to General List: December 22.

Lieut. L. T. N. Gould, R.A., and to be seconded: December 25.

Second Lieut. T. M. McKenna, 8th Hussars, Special Reserve: January 3.

Lieut. (temporary Capt.) F. W. H. Simpson, R.A., to relinquish his temporary rank, and to be seconded: January 5.

Initials of Temporary Second Lieut. S. G. Ridley, Yorkshire Regt., are as now described, and not as stated in *Gazette* of December 13.

Balloon Officers:

Temporary Lieut. Hon. A. R. Boyle, Royal Scots Fusiliers, and to be transferred to the General List; Temporary Second Lieut. G. T. Beale, Royal Fusiliers (City of London Regt.), and to be transferred to the General List: December 8, 1915.

Capt. Percival K. Wise, Royal Warwickshire Regt., and to be seconded; Temporary Second Lieut. C. G. Ronaldson-Clark, R.A., and to be transferred to the General List; Second Lieut. A. G. D. Gavin, Black Watch (Royal Highlanders), Special Reserve, and to be seconded: December 17, 1915.

Second Lieut. Ernest H. Robinson, Special Reserve: December 18, 1915.

Lieut. George F. M. Warner, Princess Charlotte of Wales's (Royal Berkshire Regt.), and to be seconded: December 21, 1915.

Temporary Lieut. J. F. Johnson, T.F.R.; Temporary Lieut. H. D. Jensen, Royal Scots Fusiliers, and to be transferred to the General List; Temporary Second Lieut. I. P. H. Preston, R.A., and to be transferred to the General List; Temporary Lieut. L. R. Briggs, London Regt., T.F.: December 29, 1915.

Equipment Officers:

From Assist. Equipment Officers, and to be temporary Capts. whilst so employed: Lieut. F. Jolly, S.R.; Lieut. H. F. T. Blowey R.A.: December 7.

Assistant Equipment Officers:

Second Lieuts., Special Reserve: W. C. Green: November 10.

W. H. Date: November 18.

E. S. Perrin: November 19.

M. C. Evans: November 21.

A. E. Thorne and C. Hirtzel: December 1.

Lieut. (temporary Capt.) C. E. Gardner, Gloucester Regt., Territorial Force; Second Lieut. (temporary Lieut.) A. Cleghorn, R.E., Territorial Force; Second Lieut. W. R. Bruce-Clarke, London Regt., Territorial Force.

Second Lieuts., Special Reserve: A. L. Curtis, W. W. Stenning, and T. G. G. Bolitho: December 6.

Temporary Lieut. E. R. Bond, Welsh Regt., and to be transferred to the General List; temporary Second Lieut. G. E. L. Woodhouse, Essex Regt., and to be transferred to the General List: December 9.

Second Lieuts., Special Reserve: R. K. C. Maguire: December 9.

S. Alenby and G. Jacques: December 12.

R. T. Lattey: December 13.

B. Mott, W. D. L. Jupp: December 15.

Lieut. G. L. Wightman, Gordon Highlanders, and to be transferred to the General List; temporary Lieut. A. J. Boulter, Leicester Regt., and to be transferred to the General List; Second Lieut. (temporary Lieut.) G. W. Swanson, Hampshire Regt., Territorial Force; Second Lieut. J. H. Rutherford, London Regt., Territorial Force; Temporary Second Lieut. H. B. Denton, R.E., and to be transferred to the General List: December 20.

Second Lieuts., Special Reserve: H. R. Lecomber, C. G. Coe, S. Davenport, J. N. D. Hcenan, J. S. D. Harries-Jones, C. T. Inman, and J. N. Mearns: December 20.

Lieut. H. MacD. O'Malley, Special Reserve, from a Flying Officer: December 24.

Second Lieut. O. H. Frost, Duke of Cambridge's Own (Middlesex Regt.), Territorial Force: December 22, 1915.

Second Lieut. Francis C. Buck, Special Reserve: December 24, 1915.

Second Lieut. H. F. Anns, London Regt., Territorial Force: December 29.

SPECIAL RESERVE

Second Lieuts. confirmed in their rank:

O. Lerwill, H. Baynes, G. C. Mills.

W. R. Lewis and C. H. Howell: December 13.

J. V. Read: December 27.

H. Slingsby: January 3.

I. Curlewis: January 17.

F. C. Buck.

W. G. Pender.

To be Second Lieuts. (on probation):

W. O. Crowe: December 7.

Harold M. McCarthy, Colin J. Campbell, Morton Allport, Gilbert H. F. Rippon, Dirk Cloete, Eustratius G. Manuel, Humphrey C. G. Watney, Townsend C. Webb-Bowen, Percy Pralle, Alexander J. Mayo, and Archibald G. Grant: December 13, 1915.

R. F. Howard: December 27.

R. K. Muir: December 28.

M. M. Sisley, G. S. Rogers, H. C. Baker, G. P. Ham, W. M. Carlyle, R. W. Catto, F. M. Carter, Frank L. Hambly, W. Scatterly, G. L. Main, Colin St. G. Campbell, William E. Roe, H. M. Corbold, J. W. Lockhart, G. P. Alexander, E. Laurie, John P. Porter, F. S. Schell, W. H. Hubbard, J. G. Ryrie, R. E. A. Macbeth, F. H. Stone, E. A. McKay, G. A. Lascelles, H. Spanner, Conrad T. Lally, W. E. McCoy, R. W. Young, C. V. Hewson, L. M. McCoy, James R. Chamberlain, J. H. Ryan, W. E. Soper, H. M. Fleming: January 1.

B. F. Crane: January 11.

Hon. F. W. S. MacLaren: January 17.

E. L. Pegge, A. J. Rickie, K. D. Abercromby, and J. Armes: December 27.

Hampshire Aircraft Parks

C. H. Douglas to be Capt. (temporary): January 1.

To be Second Lieuts.:

Wallace J. Webber, Herbert Medcalf, Sydney J. Waters, Samuel B. Smith, Roland Harrison, and Alan L. Bird: December 23, 1915.

PROGRESS AT THE FLYING SCHOOLS

The Grahame-White School—Civilian School: Report of the progress of pupils at school for the week ended January 21, 1916: Straights with instructor—Baragar, Barret, Butler, Eichelbrenner, Hathaway, Hillaby, Leigh, Parkinson, Williams, F., Sandys, Verguitt, Williams, S. Circuits with instructor—Grasset, Hallet, and McLaughrie. Circuits alone—Henshaw and Howe. Instructors during week: Biard, Manton, Hale, Pashley, Russell, and Winter.

Ruffy-Baumann School—Pupils with instructor—Flanders, Hamiaux, Edgar, Muspratt, Thomsen, Durand, and Baron d'Opstael. Straights—Vernon and De Saunoy. Certificate taken by De Saunoy. Instructors: Ed. Baumann, Felix Ruffy, Ami Baumann, and Clarence Winchester.

The London and Provincial School—Instructors: W. T. Warren, M. G. Smiles, C. Jacques, H. Sykes, and W. T. Warren, jun. Pupils doing rolling—Loomes, Stevens, Aldous, Darwin, Verlongen, Scott, Pultord, de Goussencourt, Vilain XIII., Brown, Moore, Rimer, and Verbessem. Pupils doing straits—Van Roggen, Stevens, Darwin, Hardy, Heyn, Loomes, and Snow. Pupils doing circuits—Van Roggen, Hardy, and Heyn.

The Hall Flying School—The following pupils were out receiving instruction during the past week:—With H. F. Stevens and C. M. Hill—Redford, Cook, Smith, Ridley, Sepulchre, Nicolle, Dresser. Royal Aero Club certificate taken by E. Wilkins. With A. Chave and J. Drew—F. A. Smith, Rayne, Rochford, Ormerod, Thom, Milburn, Lieut. Cooke, G. Smith, Neal, Roberts, Ridley, Chapman, Collins, Wooley. Machines in use: Hall and Caudron Government type tractors.

PATENT INFORMATION

This list is specially compiled for AERONAUTICS by Messrs. Rayner and Co., Registered Patent Agents, of 5, Chancery Lane, London, from whom all information relating to Patents, Designs, Trade Marks, etc., can be obtained gratuitously.

APPLICATIONS FOR PATENTS

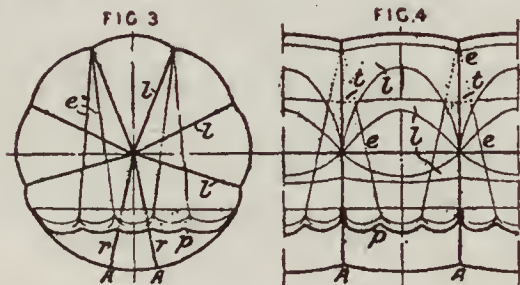
- 26 J. Birkett. Aeroplanes. 3/1/16.
- 36 W. C. Brett. Finder for aircraft observation stations, etc. 3/1/16.
- 159 J. N. Buchanan. Bomb-aiming devices for use on aircraft. 5/1/16.
- 206 A. L. Dunphy. Anti-aircraft guns. 6/1/16.
- 361 Propellers of aeroplanes, etc. 8/1/16.

SPECIFICATIONS ACCEPTED

- 9,354 Lazarte. Anti-aircraft guns and mountings therefor.

LATEST PUBLISHED ABSTRACTS

- 19,774 "Aeronautics" A. E. Downing, 81, Lodge Road, West Bromwich. The wings a^1 turn on pivots a^2 on the bars of the wing carrying frame $n^1 n^4$, the compressed air heated by the exhaust of the motor is, by the operation of suitable valves, admitted above a piston g on the frame working in a cylinder (not shown) on the body of the machine. The resulting impulse causes the wings to turn on their pivots and exert a forward propulsive action, the angle on which they turn being governed by elastics or springs r . The return stroke of the body is brought about by springs s or compressed air, and that of the wings by elastics r .
- 19,898 "Aeronautics" E. Forlanini, 21, Via Boccaccio, Milan, Italy. A dirigible balloon having transverse partitions



is provided with a number of longitudinal diaphragms radiating from the axis of the balloon. Figs. 3 and 4 show cross and longitudinal sections of the balloon having transverse partitions t and longitudinal diaphragms l radiating from the axis of the balloon. The lower edges

of the diaphragms l are bounded by cords arranged in catenary curves, so that the lift of the balloon is concentrated at the centre of each partition t , from which cords r lead to the envelope at A , where the girder is attached. A flexible partition p separates the gas from the air at the lower part of the balloon.

Full copies of the specifications can be obtained from Messrs. Rayner and Co., at the price of 1s. each.

THE MILE END ELECTION

Mr. Pemberton Billing addressed a meeting at the Single Street Schools in the evening of January 19. He had a large and attentive audience. Describing his proposals for improving the air service, he said that when he went to the House of Commons he should demand that a Committee be formed of five men from the Naval Air Service, five from the Royal Flying Corps, three civilians, and two politicians, of whom he should be one. When that Committee met, it was going to have a ten days' meet, reviewing the position of the air service, the manufacturers, where they should get their engines, and what tactics they should employ to beat the Hun in the air and to defend London. At the end of ten days, he believed they would be able to decide upon a policy at once so bold and so great and so ingenious that we would have the German airmen at our mercy. We held the supremacy of the air for a few months, but the superiority of the German machines, backed by German finance and the German nation, had since had such an effect upon their constructive policy that every man we were sending in the air now was murdered by the mechanical ingenuity of our enemy. And we were taking no steps to prevent it. To alter that state of things he asked for the votes of the electors of Mile End.

The First Lord of the Admiralty has addressed the following letter to Mr. Warwick Brookes:—

"DEAR MR. WARWICK BROOKES,—You ask me whether I have any observations to make on a statement which, you inform me, has been made by Mr. Billing in a recent speech at Mile End. The statement runs as follows:—

"You know the history of the Zeppelin raids. There was one raid over the East End, but the papers, under Government orders, said nothing. There was another raid over the East End, and part of it was blown sky high; but again nothing was said. But when a Zeppelin went across the West End of London the Government woke up, and then England went mad. Why should you discriminate between men and women being blown up in the East End and the West End?"

"If Mr. Billing is correctly reported, the only interpretation I can put upon his words is that he is endeavouring to persuade persons living in the East of London that their interests are neglected because they are poor; and that only because wealthier quarters of the town were attacked was trouble taken to meet Zeppelin raids.

"The statement is untrue; but its untruth is the least part of its criminality. A man who endeavours at a time like this to make political capital by suggesting that the military arrangements of the Government are due to class selfishness and not to a single-hearted desire for the general good is playing a most unpatriotic part. Thus would Berlin desire that all our political controversies should be conducted; and only if they are thus conducted can we fail to win the war.

Yours sincerely,

ARTHUR JAMES BALFOUR

Admiralty, S.W., January 23."

Mr. N. P. Billing has published the following letters:—

"SIR,—Owing to the abuse to which I have been subjected by certain irresponsible forces in the ranks of my political opponents in Mile End and in the Press, I feel that in justice to myself and to my friends I must ask you to publish the following letter, which I received in answer to my application that I might be put on the retired list, and stating my intention of entering Parliament:

Copy

Admiralty, January 5.

"SIR,—With reference to your letter of the 2nd ult. addressed to the Director of Air Services, I am commanded by my Lords Commissioners of the Admiralty to inform you that they have accepted, with regret, your resignation of your appointment in the Royal Naval Air Service, as from the 2nd inst.

"2. In recognition of your services my Lords have been pleased to promote you to the rank of Squadron Commander with seniority of January 1, 1916.

(Signed) CHARLES WALKER (for Secretary)

"I venture to think that this letter does not support the allegation made by my opponents that I have proved myself a traitor and a coward.

N. PEMBERTON-BILLING"

"SIR,—As a fighting man I can only interpret the occasion and singular violence of Mr. Arthur James Balfour's letter to Mr. Warwick Brookes as a sign that the Government realises it has lost Mile End. At a time when the First Lord of the Admiralty, with his characteristic felicity and discretion of phraseology, was accusing me of encouraging our German enemies—in a vain effort to save Mile End for the Coalition—our German enemies in the air were busily dropping bombs on Kent.

"I may be allowed to point out that Mr. Balfour was not the First Lord of the Admiralty during the earlier Zeppelin raids on London; and, further, that after he had held that position for a month he stated in the House of Commons that he was not aware his Department was responsible for the air defences of London! In reference to those statements of mine which have apparently so seriously occupied the mind of Mr. Warwick Brookes that he has referred them to Mr. A. J. Balfour, I can only say of them, to borrow a phrase used by a statesman with whom Mr. A. J. Balfour was very closely but, if political rumour is ever to be believed, not always happily associated, that 'What I have said I have said.'

"Perhaps the happiest answer for Mr. Balfour to Mr. Warwick Brookes, a drowning politician catching at any straw to save himself, could have been tersely phrased in a sentence which Mr. Balfour has made his own and historic—"I am a child in these matters."

"N. PEMBERTON-BILLING"

A WARNING TO AVIATORS

The Triplex Safety Glass Co., Ltd., send us the following communication:—

"1, Albemarle Street, Piccadilly,

"London, W.,

"January 19, 1916.

"DEAR SIR,—The following letter has reached us this morning:

"We had returned to us this morning a pair of goggles, which we sold to a Naval lieutenant last week. He lent these to a friend, who had a smash to-day, and we are very sorry to say that the glasses cut his cheek. We were greatly surprised to hear this, and we find that they are not Triplex, but plain glass. We are returning the glasses for your inspection, and shall be glad to hear from you on the matter. These glasses, we might add, had the small gold paper attached to them at each corner just like all the others we have had from you.

"We hope you will go into the matter thoroughly, as we are afraid that we have sold one or two more pairs of the same kind, and as you will understand this is a very serious thing for us and also for yourselves. The Lieutenant was absolutely furious this morning."

"Fortunately the goggles in question were returned with the letter, and I am able to emphatically state that the goggles neither emanated from us nor were they fitted with Triplex Safety Glass, for the simple reason that the frames are 'curved,' and as you know we do not, in fact cannot at present, make curved Triplex; the Triplex glasses in all our goggles are consequently flat.

"Apparently the firm in question have, through an error, sold ordinary glass as Triplex, and I think it is only right that your readers should be warned and see that our small gold seal trade label (STG) is on each glass that they buy.

"Yours faithfully,

"for and on behalf of the Triplex Safety Glass Co., Ltd.,

"REGINALD E. M. DELPECH,

"Managing Director."

LEGAL NEWS

R.F.C. OFFICER SENTENCED

At the Central Criminal Court on January 17, before Mr. Justice Darling, Wilfred Eagles Marsden, 27, a second lieutenant in the Royal Flying Corps, was found guilty of misdemeanour.

The learned Judge, addressing the defendant, said he was absolutely unfit to remain in His Majesty's service, and he would be dismissed from it, he (the Judge) had no doubt, and, as he trusted, with any form of degradation which the King's Regulations permitted to be used. He sentenced the defendant to two years' imprisonment with hard labour.

AIRCRAFT SECRETS

At West London Police Court on January 19 Frederick George Lewis, 60, shopkeeper, of Portpool Lane, Gray's Inn Road, was charged on remand with representing himself to be a constable of the Metropolitan Police, and thereby attempting to obtain information concerning H.M. Aircraft Service from Albert Holt and Alfred Iline, mechanics in the Royal Naval Air Service.

Albert Holt stated that on January 11 he was in the Shepherd's Bush Hotel with Iline, when the prisoner got into conversation with them about aircraft, which he professed to know something about. After saying that he had been about a bit he asked: "Do you want to earn any money by the 20th?" Asked to explain his meaning, the prisoner replied: "Nothing at all. It is my duty to go round these places and ask you fellows questions, as I am from Scotland Yard." The prisoner was afterwards given

into custody. The only other witness was Iline, who gave similar evidence. Mr. de Grey said there was no evidence against the prisoner, and discharged him.

BLERIOT MANUFACTURING AIRCRAFT CO., LTD.

Chancery Division (before Mr. Justice Neville).

The affairs of the Blériot Manufacturing Aircraft Co., Ltd., were considered on January 18 and 19 on a petition to wind up the company.

The company was incorporated on May 19, 1915, as a private company, with a capital of £160,000, divided into 140,000 ordinary shares of £1 each and 400,000 deferred shares of 1s. each. The object for which the company was formed was to manufacture, buy, sell, and deal in aircraft of all kinds.

The petition stated, among other things, that by a special resolution passed and confirmed on May 22, 1915, and June 14, 1915, the company was converted into a public company and the capital was increased to £200,000, divided into 180,000 cumulative and participating ordinary shares of £1 each, and 400,000 ordinary shares of 1s. each; that by a prospectus issued to the public and dated June 21, 1915, subscriptions were invited for £100,000 of its share capital—namely, £95,000 ordinary shares and £5,000 in 1s. shares—and the prospectus stated that the object was to provide a much larger number of aeroplanes to the order of His Majesty's Government for the flying services of the Admiralty and the War Office, by acquiring and extending the well-known aircraft business in this country of M. Blériot.

The petition also stated that the prospectus set out a certificate that the profits of the business for twelve months ended March 31, 1915, amounted to £39,393 7s. 10d.; that by a contract dated June 17, 1915, made between a syndicate and the company, the company agreed to purchase the business of M. Blériot for £100,000, to be paid as to £30,000 in cash and as to £43,000 by the allotment of 43,000 fully paid-up shares of £1 each, and as to the balance of £27,000 either in cash or shares at the option of the syndicate; that no return of allotment of shares had been made to the Registrar of Companies; that the whole of the 95,000 ordinary shares of £1 had been allotted and paid up in full cash, that 43,000 deferred shares of 1s. each had been allotted to the syndicate in part payment of the purchase price, that 100,000 of the 1s. shares had been allotted and issued to the syndicate for a consideration other than cash, and a further 100,000 of the 1s. shares had been allotted to the syndicate and not paid for in full.

The petition went on to state that the company had wholly failed to acquire the business of M. Blériot, and that there was now no prospect of acquiring it; that the syndicate had nominated a Mr. Harry John Lawson and a Mr. Langford to be directors of the company; that although the syndicate had not transferred the business of M. Blériot to the company, the company paid the syndicate on June 29, 1915, £6,000 and on July 1 £7,000, and on August 31 £3,000; that Lawson and a Mr. Swinburn, who was a director of the syndicate, had improperly taken control of the business of the company and had dealt with its assets without the consent or knowledge of their co-directors, and in particular had paid £1,000 to the syndicate to whom no such sum was due; that Lawson was entitled to the whole of the issued share capital of the syndicate; that the petitioner had applied for and had been allotted 10 ordinary shares of £1 for which he had paid in full on the faith of the prospectus. According to the petition the company had not at any time held a statutory meeting nor had the directors sent to its members or filed with the Registrar of Companies a statutory report as required by Section 55 of the Companies Act, 1908. In these circumstances the petitioner said that the substratum of the company was gone and it was just and equitable that the company should be wound up.

Mr. Grant, K.C., and Sir D. Warmington appeared for the petitioner; the Hon. Frank Russell, K.C., and Mr. Whinney for the company; Mr. Van Breda and Mr. Russell Gilbert appeared for shareholders supporting the petition; Mr. Vanneck appeared for the Duke of Manchester, the chairman of the company; Mr. H. Slesser held a watching brief for a party interested.

Mr. Grant, in opening the case, said that the memorandum and articles of the company were signed by seven solicitor's clerks for one share. They held a meeting three days after the registration of the company, and passed certain resolutions which they confirmed at a subsequent meeting on June 14. By one of the resolutions they altered the constitution of the company from a private company to a public company, and by another resolution, acting under articles, they altered the voting power of the ordinary shareholders so that the control of the company would be invested in the holders of the 400,000 preference shares. On June 17 they held a meeting at which they nominated five directors of the company—namely, the Duke of Manchester (chairman), Admiral the Hon. Sir E. Fremantle, Sir A. Guinness, Mr. Casson, and Mr. Swinburn. There was no share qualification for directors. The prospectus was issued on June 21 and the lists closed on June 28, with the result that the whole of the £95,000 in ordinary shares of £1 were applied for and subsequently paid in full, and about 43,000 of the 1s. shares were applied for, and the company went to allotment, although the option held by the syndicate to purchase M. Blériot's business had determined on June 26. On July 21 there was a meeting of the directors, attended by Lawson and Langford, at which Law-

son handed in a nomination by the syndicate of himself and Langford as directors of the company. Sir E. Fremantle objected to sit at the same board with Lawson, who had been convicted of fraud and had served a term of imprisonment, and a resolution was proposed by Mr. Casson and seconded by Sir E. Fremantle against Lawson's being a director. The meeting was adjourned to July 23, when Casson and Sir E. Fremantle were outvoted. Thereupon Sir E. Fremantle immediately resigned his directorship. Sir A. Guinness never attended a board meeting after this and resigned his directorship in the following September. This left the control of the board and of the company in the hands of Lawson.

Meanwhile M. Blériot refused to transfer his business to the company, the syndicate, or its nominee, and on July 29 the syndicate began an action for specific performance against M. Blériot and made the company a defendant, and that action was still pending. On June 28 a board meeting was held at which the majority of the board passed a resolution appointing Lawson and Langford a committee to draw cheques and exercise all the powers of the directors. At the beginning of October Casson, who had been in America, returned, and asked to see the minute book and allotment sheets of the company. He was refused, and on October 22 the winding-up petition was presented by Mr. Cassells.

On October 23 a writ was issued by the company against Casson and Cassells for conspiracy and for an injunction to restrain them from proceeding with the petition; but the action was dismissed by consent with costs. In the meantime a summons was taken out against Lawson, Langford, and Swinburn for their default in not filing a statutory return with the Registrar of Companies. That was heard on December 29, and they were fined £10 each and £15 15s. costs. On December 29 they applied for and obtained an extension of time to January 18 to answer the affidavits filed in support of the petition. On January 5, 1916, there was a meeting of the directors, which Casson attended, and after he had left the meeting a resolution was passed to call a general meeting of the shareholders on January 13, and the same evening circulars were sent out by the board asking the shareholders to pass resolutions—

(1) To take up the manufacture of aeroplanes other than the Blériot machine;

(2) To remove Casson from being a director and to appoint another person in his place.

Casson, on hearing of this, sent out a counter-circular, with the result that the proposed resolutions of the directors were not passed.

Mr. Vanneck, for the Duke of Manchester, who was the chairman at the meeting, asked to read an affidavit by the Duke as to what occurred at the meeting.

The Duke's affidavit stated that he was an independent shareholder and director, and in no sense a nominee of the syndicate. He issued the circular of January 5. Before the meeting he had arranged that all the directors should resign and that an independent board should be elected. He had intended to explain fully to the meeting the position and prospects of the company. He believed that he could remove all M. Blériot's objections and obtain for the company the transfer of his business. There was such persistent interruption and uproar at the meeting that he found it impossible to address the meeting, and at last he contented himself with simply moving the resolutions, which were lost. He asked that a fresh meeting of the shareholders might be summoned by the Court with an independent person as chairman appointed by the Court to ascertain the wishes of the shareholders.

Mr. Grant, K.C., in summing up his arguments, said that direct charges of misconduct had been made against Langford, and of fraud and dishonesty against Lawson, and neither of them had filed an affidavit in answer to the charges, but Swinburn was put forward, and he said that he was informed and believed this, that, and the other thing. But nothing was known of him except that he was a clerk to Lawson and a director of the syndicate, which was Lawson under another name. If ever there was a case in which a winding-up order should be made this was the case.

Mr. Russell, for the company, said that the petition was based on three grounds:—

- (1) The non-holding of the statutory meeting of the company;
- (2) The misconduct of directors; and
- (3) That the substratum of the company was gone.

The first was a purely technical objection. Secondly, there had been no misconduct by the directors. The head and front of the alleged offence was the payment of the three sums of £3,000 and the sum of £7,000. But the agreement of June 17 between the syndicate and the company provided that the purchase price should be £100,000, of which £10,000 should be paid in cash forthwith, and the agreement also imposed on the company an absolute obligation to pay all the preliminary expenses of the company up to £6,000. Those two sums made up the £16,000 that had been paid to the syndicate. Even if there was misconduct, which was denied, that was no ground on the authorities for winding up the company. The shareholders had their remedy, and could take proceedings against the directors to replace moneys improperly paid away.

Finally, it could not be said that the substratum of the company was gone unless the company was insolvent. Here the company was solvent, and had large assets, and the Blériot business

was not the principal object of the company. Under the memorandum its principal objects were the manufacture and sale of and dealing in aircraft generally, and they could undertake the construction and sale of other aircraft than the Blériot machines.

Mr. Justice Neville, in delivering judgment, said:—This from many points of view is an unfortunate case. M. Blériot is, as everybody knows, an inventor of aircraft of world-wide repute. He gave to Mr. Casson, the chairman of the syndicate, an option to purchase his English business, and the syndicate entered into an agreement with the company to resell it to them at a large profit. The prime mover in the whole matter was Lawson, against whom much has been said and much has been alleged, and he has indicated his discretion by omitting to give any evidence. By a series of contrivances exhibiting considerable astuteness he has managed to get the affairs of the company under his control, and that, I think, is not the least indication of his financial talents.

The prospectus of the company is free from any ground of complaint whatever, but astute financiers know that the simplest method of deceiving the public is to state the truth and nothing but the truth, and so to arrange matters that they are able to effect their schemes. In the present case neither M. Blériot nor any of the subscribing public had any means of knowing that all the power would be in the hands of persons controlled by Lawson. I am going to say nothing about the statutory meeting of the company. I have not sufficient evidence before me on the point. The main question is whether the substratum of the company is gone. The company had the option of acquiring the business of M. Blériot, and I think that if the company had been honestly formed he would probably have completed, but he very soon found that the company was not in a position to carry out the contract that he had made with Casson. It had not got the necessary working capital for which he stipulated, and the 43,000 shares which the company proposed to allot to him were not the 43,000 ordinary shares which he was entitled to expect.

It appears to me that when once one finds that the company had no reasonable probability of carrying out the Blériot contract, it is a company which obviously cannot carry into effect its main object. I am satisfied that the subscriptions by the public would have been quite different had they known that the company had no right to carry on the Blériot business. Indeed, I think that if the company were to carry on aircraft business under the name of Blériot they would be liable to an injunction at the suit of M. Blériot to restrain them from using his name. I think that goes a long way in determining whether the substratum of the company has gone.

The company was, in fact, formed to carry out the Blériot contract, and, in my opinion, the substratum of the company is gone, and, although it is in a primary sense a question of the construction of the memorandum, the surrounding circumstances must be considered in arriving at the construction. This, in my opinion, is a sufficient ground for a winding-up order.

But there is another ground. Here the company has considerable capital, and it is alleged that there is misconduct by the directors. It is truly said by Mr. Russell that the mere fact of misconduct is no ground for winding up. The words "just and equitable" are words of the widest significance, and do not limit the jurisdiction of the Court to any case. It is a question of fact, and each case must depend on its own circumstances. When I speak of the conduct of the board of directors I mean Lawson, because his was the controlling hand. I think the moneys of the company have been misapplied, and that the company is so constituted that it is deprived of its usual remedies. This is again sufficient for a winding-up. I make the usual order.

Mr. Grant: I ask that the company should have no costs. The gravamen of the charge is against Lawson, Langford, and Swinburn. They are really representing the company here.

Mr. Russell: I submit that there is no ground for departing from the usual order as to costs.

Mr. Justice Neville: In this case I think it right that the company should have no costs.

NEW COMPANIES REGISTERED

AIR SERVICE, LTD., 233-235, Queen's Road, Battersea.—Capital £100, in £1 shares. Constructors and manufacturers of kite, nurse, and spherical balloons, airships, and aircraft of all kinds, etc. First directors, T. Edwards and A. Leather.

WARE AND DE FREVILLE, LTD., 6, Great Marlborough Street, W. Capital £10,000, in £1 shares. Manufacturers and dealers in aluminium alloy pistons for aircraft and other engines, etc. First directors, A. E. Ware and G. P. H. de Freville.

C. A. VANDERVELL AND CO., LTD.—Registered January 1. Capital £350,000 in 300,000 ordinary shares of £1 each and 1,000,000 deferred shares of 1s. each. Objects: To take over the business carried on by C. A. Vandervell at Warple Way, Acton Vale, W., as C. A. Vandervell and Co. Private Company. C. A. Vandervell is permanent governing director, subject to holding £50,000.

WINDING-UP

LOW PETROL ENGINE CO., LTD.—Meeting, February 25, at Alderman's House, Bishopsgate, E.C., to receive liquidator's report.

AERONAUTICS

A WEEKLY JOURNAL DEVOTED TO THE TECHNIQUE OF AERONAUTICS

(FOUNDED 1907)

Edited by JOHN H. LEDEBOER, B.A., A.F.Ae.S.

VOL. X. No. 120 (NEW SERIES)

FEBRUARY 2, 1916

[Registered at the G.P.O.
as a Newspaper]

ONE PENNY

THE AERONAUTICAL INSTITUTE AGAIN

ECONOMY and thrift are the keywords of the day. They are qualities which are continually being enjoined upon a patient public by the Government. A step towards their realisation was taken when the Treasury, in the early days of the war, forbade the formation of new limited liability companies or any fresh issue of shares save by special permit. The step was a wise and salutary one. But if one can, as is confidently asserted, drive a coach and four through any Act of Parliament, it is to be presumed that there exist ways and means at the disposal of the ingenious to circumvent the ordinances of even the Treasury and to evade the purpose wherefor they were enacted, which was principally to prevent a fool and his money from being parted. The war has witnessed a large and alarming increase in the number of so-called charitable organisations. Appeals for funds to be devoted to diverse charitable and other purposes have fallen thick as autumn leaves, nor does the supply manifest any signs of diminishing.

As I write I have before me a lubricating effort issued by the "Aeronautical Production Committee of the Aeronautical Institute of Great Britain." This precious communication, be it added, was not addressed to AERONAUTICS; for, unless the postal authorities are to blame, the committee in question has lately refrained with commendable discretion from inflicting upon us any of its outpourings. We are indebted for the privilege of perusing this interesting circular to one of our readers, a prominent public personality, whom it reached unsolicited.

The circular is dated January 21, 1916, and bears the signature "on behalf of the Executive Committee" of L. Blin Desbleds. The members of the Executive Committee, whose names are boldly printed at the head of the letter, are Mr. Charles Bright, Sir George Greenhill, Colonel F. N. Maude, and L. Blin Desbleds. In addition, the names of four Frenchmen of note are given as "experts co-operating with the Institute." Appended to the circular is a printed list of names "of those who accepted the invitation to attend the meeting (Sir William Ramsay, D.C.L., LL.D., Litt.D., in the chair) which inaugurated the Aeronautical Institute of Great Britain," and a further typewritten list of "some recent additional supporters."

From the text of the circular itself, which is too long to reproduce in full, more especially in view of the prospective increase in the price of paper, I gather the main and salient fact that this Production Committee requires £5,000, or, to use its own words, "invites 5,000 suitable persons to become members at a subscription of one guinea each." That word *suitable* is a really delightful example of unconscious irony, suitability in this case being apparently the possession of a guinea and the willingness to part with it.

And to what purpose is this sum—not inconsiderable as matters stand these days, though less, as the committee hastens to explain, than the price of three aeroplanes—to be devoted? Why, simply "to run its whole work of organisation with full effect." Over the precise scope of its work

of organisation the committee draws a discreet veil, save only that it is (underlined) *desperately needed and which it would be criminal to neglect*. This work, it would seem, "is one which is not, and for various reasons cannot, be undertaken by the Government" (I take no responsibility for the grammar of these felicitous phrases).

In view of the fact that this precious committee is apparently widely distributing this appeal for funds, a few facts should be plainly stated. To the first I have already referred, namely, the entire absence of any definite statement of the nature of the committee's work or the scheme it proposes to adopt. Until details are revealed in this respect I would respectfully suggest to intending subscribers the desirability of keeping their money in their own pockets. Secondly, I would point out that this institute is entering into direct competition with the Royal Aero Club by placing "at the disposal of its subscribers a members' room and an exhibits' room, together with a library."

But chiefly I would lay stress on the curious fact that, save for the distinguished foreign names which are being so industriously boomed, this professedly aeronautical body comprises no one connected with practical aviation or with the industry or even anyone known in aviation circles, with the solitary exception of Professor Sir George Greenhill, a mathematician of some repute, Professor Bryan having long since resigned from the committee. Incidentally, to Sir George Greenhill's name printed in this circular is appended the designation, "member of the Government Advisory Committee for Aeronautics." Whether Sir George Greenhill approves of this method of procedure to advertise the Institute I am unable to say. Nor do I know the opinion of the Advisory Committee in regard to the matter. No doubt we shall learn in due course.

Finally, one can only deprecate in the strongest terms the attempt to associate the name of Sir William Ramsay with the Institute. This may have been done unintentionally, but the fact remains that most people on carelessly reading the printed list of names accompanying the circular and seeing at the head of it Sir William Ramsay's name in heavy capitals would naturally come to the conclusion that he was in some way associated with the Institute, whereas in point of fact he simply presided at the meeting at which it was originated and has no connection whatsoever with the existing body. The same consideration applies to the list of names which follows his own, which appears imposing enough at first sight, but on examination resolves itself into an enumeration of those *who accepted the invitation to attend*.

Allied and German Aircraft Losses

Comparison of the figures relating to aircraft losses on the Western front, given respectively in the House of Commons and by the German Headquarters report, is distinctly interesting, and incidentally reveals marked discrepancies. Mr. Tennant's figures give the losses for the

last four weeks—apparently the last week in December and the first three weeks of the present year—while the German compilation covers the period from October 1 to the present time, or approximately fifteen weeks. The enemy claims to have lost only 16 machines on the whole front during this time as against 63 Allied losses. On the other hand, Mr. Tennant for the shorter period gives our—*i.e.*, British—losses as 13, as against German losses of 9, and probably 11. Now, obviously, both sets of figures cannot be right, and on the very face of it, apart from other considerations, the Hun figures are clearly mendacious, more particularly in regard to their own losses. If in four weeks we have brought down along our relatively short sector of the front at least nine enemy machines, it is perfectly clear that along the whole extended front held by us and the French, not to mention the Belgians, the enemy has lost more than sixteen machines during a period over three times as long. It is, of course, a favourite trick, and, in fact, perfectly sound strategy to minimise your own losses and to over-estimate those of your opponent. But in this case the Hun is over-doing it. Observe also that the official German statement is very craftily worded. The list, it says, “represents figures which could be ascertained by us from enemy aeroplanes which fell into our hands.” Now, if that statement is carefully read, it will be seen that it does not state that the whole of the sixty-three machines claimed by the Germans actually fell into their hands, but that the figures were ascertained from such machines as fell into their hands. In any case the percentage of losses as given by Mr. Tennant is distinctly comforting, and may well confound the scare-mongers. Our percentage of losses amounted to just one per cent., while that of the Germans was no less than between 3 and 4 per cent., reckoning the percentage from the number of flights made over enemy lines.

An Unfair Distinction

I am far from anxious to assume, or to appear to assume, the rôle of the inveterate grumbler or the disgruntled critic. But since the Press is given as one of its principal functions the publishing of legitimate grievances with a view to their being remedied, I regret that the grumbler's part has to be undertaken again on this occasion. Let it be quite clear before proceeding that this grumble has nothing whatever to do with politics or controversial matters. It simply concerns a legitimate grievance in the industry and a case of what appears to be, according to my information, gross unfairness. The point is this. The great bulk of pupils at civilian schools, having obtained their pilots' certificates, join one or other of the air services. Consequently, one may rightly assume that these schools are engaged on Government work. Accordingly, one may further assume that the instructors and others engaged in running these schools and whose services in that capacity are indispensable, are entitled to Government service badges, at any rate, fully as much as those who are granted badges for sitting on a London office stool. Leaving the ethics or the expediency of the whole badge question aside, the point at issue is that, whereas such badges have been granted to the staffs of certain schools, they have apparently been refused to others. Now it is surely a principle of elementary justice that a law, once adopted, should be made to apply universally and without discrimination unless for some very excellent reason. But in several cases that have come to my knowledge such discrimination appears to have been exercised for no apparent cause. It is surely high time that a decision, whatever its nature, should be finally given in the matter, and once given applied to every case alike.

Aviation in Politics

For some time since it has been the artful cue of certain wily writers in the Press persistently to disclaim any political bias in the views expressed in their articles.

Methinks they protest too much and too loudly. More especially so when the subject under discussion, dragged forth possibly for the purpose of obtaining political *kudos* or to serve as an electioneering tag, is wholly and admittedly beyond the scope of their knowledge or comprehension. Without saying more on this point—save only to insist once again that politics and personalities alike form no concern of ours—let a recent utterance stand forth in all its stark impudence. The writer is one Robert Blatchford; his medium the *Weekly Dispatch*:—

“Now I shall make bold to assert that our air service is in a very unsatisfactory state, and that, apart from our inability to make aerial attacks of such scope and vigour as to win the war, we are not in a position to defend London and our coasts against the threatened air raids of the enemy. The air service has suffered severely from the loss of Lord Fisher. Those are the facts, and they are facts of a most alarming nature.”

A cobbler, it has been said, should stick to his last. Unless he follows this wise counsel, he is apt to make bold to assert his own ignorance. Mr. Blatchford may be an authority on Socialism; since I am not for the moment concerned with his qualifications in that respect no comment is offered. But, emphatically, he is no authority on aeronautics, and possesses no first-hand knowledge in any shape or form whatsoever regarding the possible or existing methods of defending London—or any other part of the country for that matter—against aerial attack. Accordingly the bombastic statement reproduced above is, to place the best complexion upon the matter, distinctly presumptuous. On the other hand, it happens in point of fact to be incorrect in every single particular, and only serves to confirm our view, clearly expressed last week, that our air services, forming as they do an integral part of our scheme of national defence, should be left out of the sphere of political controversy. Or, at any rate, if they have to be publicly discussed, if there do in fact exist faults calling for urgent remedy, let the matter be dealt with by those who know their business.

Perpetual Motion

Exactitude is the last of our sins. No other nation rivals us in inexactitude. Especially so in the matter of quotation. Nevertheless we mean well, and usually get there in the end, accompanied by all the joys of muddling. Thus we exclaim, “a little knowledge is a dangerous thing”—an aphorism which, fortunately, was never uttered by mortal poet. Yet if we have blundered, our meaning is sufficiently plain. By the phrase we simply intend to convey our firm-rooted opinion that, even though you be an “expert,” you should not blunder into print unless you are sure of the elements of the subject you happen at the moment to be dealing with. Harken to this gem of wisdom carefully culled from the columns of the *Times*, in order that the wonders of these stirring days may be preserved for the edification of posterity:

It is a remarkable fact that a mere descent down a slope of 1 in 5 has the effect of doubling the horse-power during the period of that descent.

A great secret, then, has been discovered. With the good of humanity at large, in our heart, we present the notion to Mr. Ford, since it is obviously applicable to car design. Mathematically put, the equation is quite simple. You select your hill with the requisite gradient, and down it you run your car. “During the period of that descent” your horse-power is automatically doubled owing simply to that “mere descent.” The solution is obvious: while the car is running down the hill, or the aeroplane is descending along its slope, you switch off your added 100 per cent. of horse-power or to accumulators, and at the bottom of the hill—or the slope—you switch the energy stored in your accumulators on to your engines, and so drive them until you come to the next hill—or slope. My congratulations to the *Times* for having solved the problem of perpetual motion.

J. H. L.

THE AEROMARINE 100 H.P. MOTOR

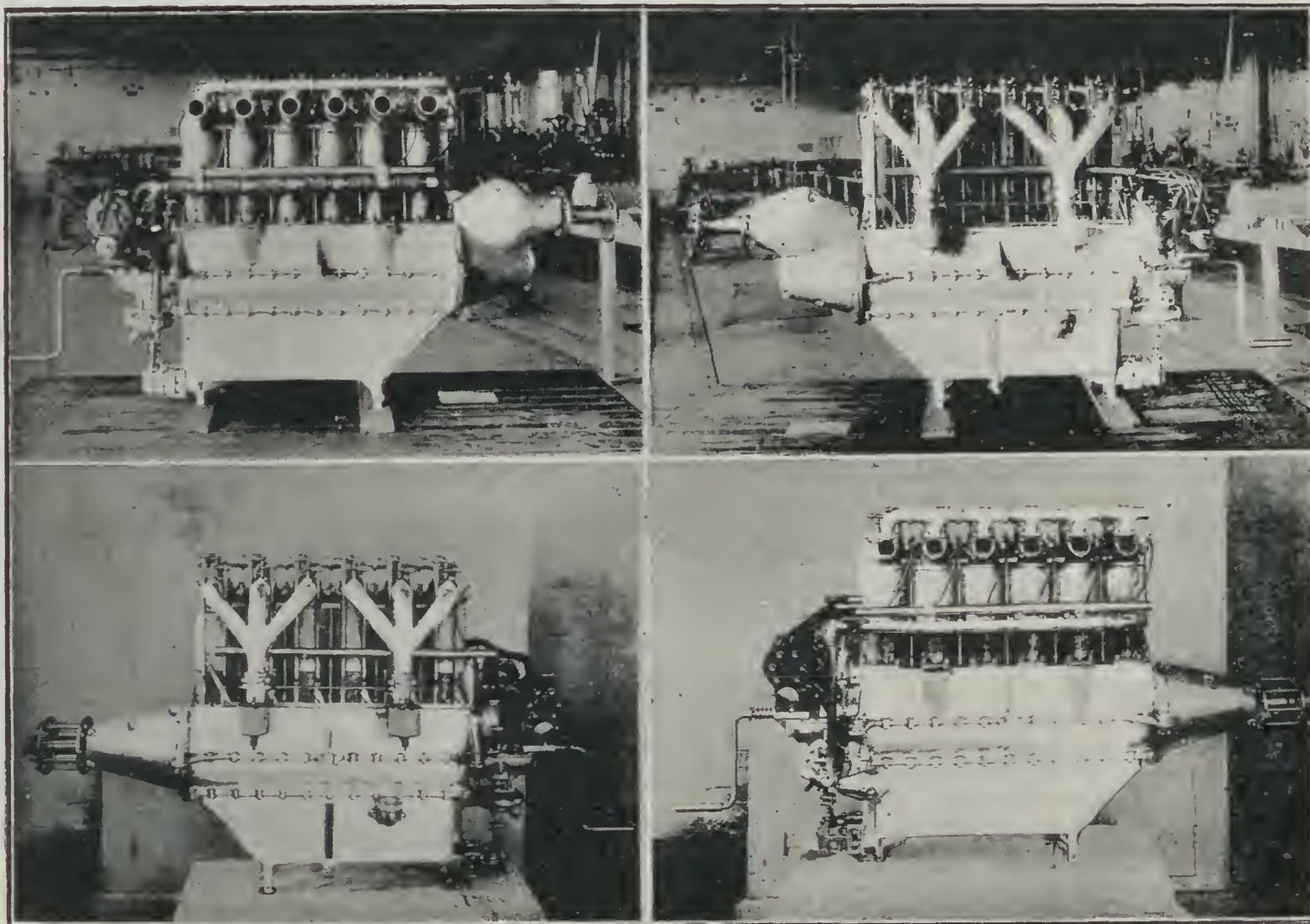
THE following is a brief description of the Aeromarine Plane and Motor Co.'s latest 100 b.h.p. aeronautical motor, built with gear-driven propeller shaft.

The motor follows closely the latest foreign design and practice, viz., six vertical cylinders, $4\frac{5}{16}$ in. bore, of vanadium iron, machined all over inside and outside, on which are electrically deposited the copper water jackets to a thickness which has been found substantial and resilient. In the process of deposit, the jacket becomes a practically integral part of the cylinder, ensuring against water leaks at any of the variable temperatures at which the motor may be called upon to perform.

Great care has been exercised in the development of the flanged base of these cylinders in order to retain the initial strength necessary to withstand the working stresses, at

of construction is not alone their exact uniformity of weight (which in itself is absolutely essential where speeds of 2,000 r.p.m. are reached and maintained), but it further enables the use of rods of such light weight that the stresses due to transversal inertia and centrifugal forces, etc., are reduced to a minimum.

The hollow crank shaft (hollow for the purpose hereinafter to be described) of $5\frac{1}{8}$ in. throw is Aeromarine Special design, having seven main bearings, $1\frac{3}{4}$ in. by $1\frac{5}{8}$ in. long; each crank throw is counterbalanced by integral balance weights on both cheeks of each crank. As a result of careful design and continued tests these weights have been developed to a point of efficiency that creates a running balance in simple harmony with reciprocating parts of motor.



THE AEROMARINE 100 H.P. MOTORS, GEARED DOWN AND WITH DIRECT DRIVE.

the same time permitting of uniform expansion of the base of the cylinder walls and the skirt of the engine piston:

The valves employed are of concentric type, $2\frac{1}{4}$ in. diameter, manufactured from special materials and of Aeromarine construction, arranged in the cylinder heads over the centre of the pistons, which, together with an absolutely first-class arrangement of fully adjustable rocker-arms and push-rods, really represent the outcome of patient thought and work, combined with the intimate knowledge of the problems to be dealt with.

The hollow cam shaft (hollow for the purpose hereinafter to be described) is machined from high-grade steel, with integral cams. The cam shafts are provided with seven bearings of adjustable split bushings, type $\frac{7}{8}$ in. diameter by $2\frac{1}{8}$ in. long. All these cam shafts receive special heat treatment, and all cams and cam shaft bearings are hardened and ground true.

The connecting rods, of I-beam section, are machined from drop forgings of nickel steel. The merit of this form

The entire shaft is machined from the solid round forged billet of specially selected steel, heat-treated and ground true. The crank shaft is assembled to the upper portion of crank case; this permits the lower portions of the case to be removed readily, whilst the remainder of motor is undisturbed in the aeroplane.

The main bearing caps are each provided on their under side with a drop forged steel bridge piece, drilled to receive the retaining bolts; these retaining bolts are arranged in transverse line to the crank shaft, and pass entirely through the crank case in a vertical direction, and enter nuts on the top of cylinder flange. By an ingenious method these bolts are securely anchored in the crank case, thus enabling the nuts to be tightened or removed without disturbing the bolt from its permanent position.

When this construction is considered in connection with the tie-down rods extending upward to light bridge pieces, resting on and across the top of cylinder heads, it will be readily seen that this is an ideal method of staying the inter-

nal stresses, initial pressures of explosion, and reaction forces, etc.

The crank case at the propeller end of these motors is so designed as to permit the same motor being used with either a gear-driven propeller or with the propeller mounted directly on an extension fitted to the crank shaft for that purpose.

The gear drive consists of a pair of gears of 1 to 1.75 ratio; the small gear is mounted on the end of the crank shaft and is carried by a ball bearing on both sides of its hub, the ball bearings in their turn are carried by the aluminium gear housing; this housing is bolted to the motor on a dowel flange face, securing at all times an absolute alignment. In the upper compartment of this housing is fitted the propeller shaft, mounted on large annular ball bearings. This shaft is also provided with thrust bearings, two sets mounted in both directions enabling the motor to operate as tractor or pusher without change; when it is desired to use the motor with the propeller coupled direct it is only necessary to dismount the gear housing from the crank case and mount the extension on to crank shaft in the same position, and by the same means as were used to retain the gear drive pinion the straight drive housing may now be mounted on to the dowel flange face, together with its annular and thrust bearings as hereinbefore mentioned.

At the other extremity of crank shaft further additional ball bearings are employed to carry the load of driving the cam shaft, water and duplex oil pumps, and magnetos.

All bearings throughout the motor other than ball are die-cast Fahrig metal and interchangeable.

These motors have been subjected to exhaustive tests in order to prove their mechanical construction, ignition, and carburetter efficiency, with the result there has been made as standard equipment two Bosch magnetos, representing duplex synchronised ignition, each cylinder being provided with two spark plugs. Two three-way intake manifolds and two Zenith carburetters with synchronised throttles have proved an efficiency impossible to obtain with any form of six-cylinder manifolds and single carburetters.

The Aeromarine oiling system has been designed to meet the requirements demanded in the present-day aeronautical motors, viz., that lubrication shall be maintained and unchanged, irrespective of the angle of ascent or descent, loop the loop, or upside-down flying.

These motors are provided with oil reservoir of the five-gallon capacity. When the motor is running, the gear-driven duplex high and low pressure oil pump takes oil from the reservoir and delivers it through ways machined in solid walls of crank case, etc., to the crank shaft bearings, through these bearings and into the hollow crank shaft; thence to the driving gears mounted on crank shaft, connecting rod bearings, etc.

By means of one of these drilled oil-ways, oil is delivered to and through the hollow cam shaft; the cam shaft is cross-drilled in line with its bearings, by this means supplying them with constant oil feed; also oil is carried to the cam follower guides, etc.

All the surplus oil is thrown by the rapidly revolving parts to the sides and bottom of the under half of crank case, whereupon it drains down and through an integral hollow extension of the under half of crank case. This extension leads down and through the oil in reservoir to the low-pressure gear train of the duplex oil pump, from which it is returned to the reservoir and cooled.

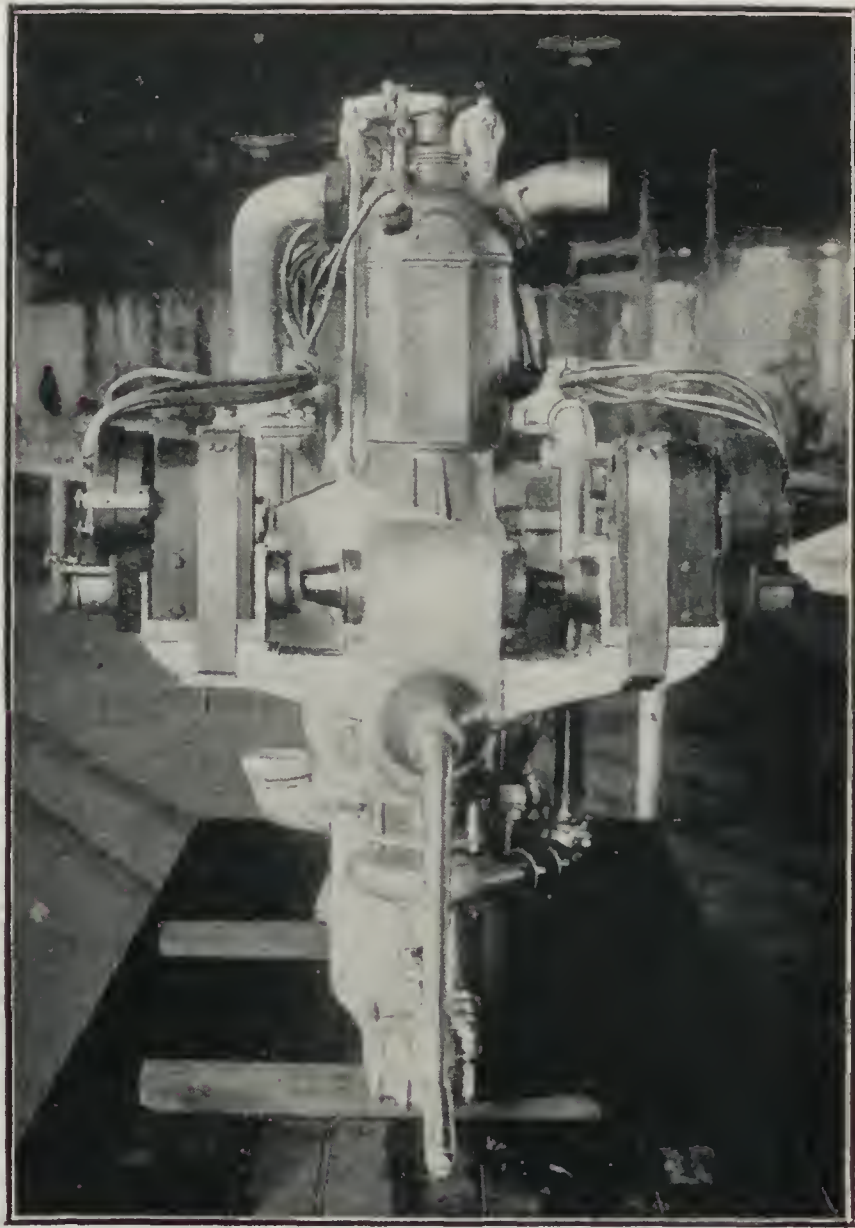
ART SMITH'S LOOPS

In connection with the article describing and illustrating Art Smith's loops, which appeared in our issue of December 29, we are informed by H. B. Wise, sales manager of the American plane and Motor Co., that this looping was done with a six-cylinder direct Aeromarine motor. Arthur Smith has been using these motors continually throughout the season and has had absolutely no trouble, and recently purchased a new motor for spare.

Charles Niles, another World's Fair flyer, has taken up a Government contract in Japan, and is now using two Aeromarine motors in his work in Tokio. "R. G. Fowler," writes Mr. Wise, "who is a personal friend of the writer's, is now in New York, and is contemplating building a two-motored military tractor type

By means of this system the crank case is constantly and thoroughly scavenged of all surplus oil, and the danger of flooding the cylinders at any position of the motor is entirely eliminated.

Large screens are fitted to both the intake and exhaust ports of the duplex oil pump; also a screen is provided in the oil-filling elbow. A special oil-pressure regulator is built integral with the oil reservoir; by simply removing one nut the bell-shaped cover may be removed and the oil pressure adjusted to suit the installation of the motor, location of the pressure gauge, and running speed, etc.



END VIEW OF THE 100 H.P. AEROMARINE

These motors can be provided with positive means for driving generator required for lighting, starting and stabilising; also for driving petrol pump and revolution indicators. It has been expressly kept in view that they should in every detail conform to the requirements of the United States Government specifications.

The direct type of motor is the same bore and stroke and general dimensions as the above-described motor. This motor, however, drives the propeller direct at a speed of 1,400 r.p.m. The same oiling, ignition and water circulation and lubrication pumps are employed.

machine of advanced type, using our six-cylinder direct 90 h.p. motors. Our much heralded but long-delayed twelve-cylinder motor we hope soon to be able to make great announcement about."

THE SYMONS MEMORIAL GOLD MEDAL

The Symons Memorial Gold Medal, which is awarded biennially by the Royal Meteorological Society for distinguished work in connection with meteorological science, was presented for transmission to Dr. C. A. Angot, Bureau Central Météorologique de France, on January 20.

AIRCRAFT INSURANCE

Aircraft insurance premiums, says Mr. McKenna, cannot be deducted from income like life insurance premiums.

PROGRESS OF AMERICAN AVIATION

By E. LARUE JONES, American Editor

AMERICAN PREPAREDNESS: Official Statement

"THE subject of preparedness in our Navy for the defence of this country is the one that is uppermost in my mind," says Secretary of the Navy Daniels, in a letter given to the Press. "The preparation of an aeronautic service as a part of our Fleet is an important question that is being given every consideration. The difficulties that have been encountered are in a great measure those that would be expected in a new service like aeronautics. In spite of these, it is believed that decided progress has been made in the development of aircraft suitable for naval use. An aeroplane or dirigible expressly developed for land use is not necessarily suited for work at sea with the Fleet.

"All problems relating to the development of an aeroplane for use at sea have been attacked by our aviators at the Aeronautic Station at Pensacola, and by our designers and experts in the Navy Department. Also special observers have been stationed abroad since this war began; one officer in Berlin, one in France, and one in England, who are constantly watching developments to give us the latest information regarding the use of aeroplanes, as well as dirigibles, in actual warfare. These officers are some of our ablest aviators. As a result of careful consideration of a large amount of information obtained from abroad, and by a large number of experiments at Pensacola, together with many tests of models in the model basin and wind tunnel at the Washington Navy Yard, it is now believed that we are in a fair way to produce an aeroplane suited to naval use. At least it will be a great improvement over anything that we have been able to obtain in the past.

"There is one question that is now bothering us, and has been from the very beginning, and that is a suitable, reliable motor of sufficient power for naval use. Many motors have been produced in this country, but on tests have not come up to the requirements. This has undoubtedly been greatly due to inexperience of our manufacturers in the development of this kind of machinery, which is again of a special kind. The best automobile motors are not equal to the work required of an aeronautic motor, so that even our manufacturers of the high-grade automobile motors must give special attention to the development of an aeronautic motor, and this is now being done, and it is hoped and believed that in the very near future our manufacturers will produce a motor as good as any in the world.

"One of the most important questions that was laid before the Naval Consulting Board which I have organised was the question of the development of an aeronautic motor. That Board, of which Mr. Thomas A. Edison is chairman, has appointed a sub-committee to give particular attention to this question.

"The manufacturers of aeroplanes and aeroplane motors in this country have not been lacking in the desire to assist me in developing aeroplanes and motors for the Navy. In fact, they have been anxious and willing to assist in every way possible. In order to reciprocate, I have directed that contracts be placed for aeroplanes, which have been developed in design only, even before the actual machines have been built. This was necessary because aeroplanes for sea work had not been developed in this country, and there would have been too much delay in waiting until the aeroplanes had been built and fully tested out. Also, it would have been a hardship for the manufacturers to advance the money to have thus developed machines. As a result, machines that have been ordered have not been delivered in the time contracted for, but this was to be expected, considering the development work necessary, and I have taken occasion to make due allowance for such delays, especially as I felt certain the manufacturers were making their best efforts to comply with the contracts.

"The Navy now has a splendidly equipped aeronautic

station at Pensacola. The old Navy Yard, with its shops and storehouses, is well suited to the work required. The location of this station, on a large bay with a climate suited to flying, but yet sufficiently variable to give all kinds of experience in flying, is excellent. By February 1 there should be thirty-six aeroplanes at the station for the instruction of officers and men and for all kinds of experimental flying. The aeronautic ship, *North Carolina*, should by that time be fitted out with the launching device that has been developed, and equipped with five aeroplanes. With this equipment a series of exercises in the open sea will be undertaken. These will include scouting under all kinds of weather conditions, landings and gateways in the rough, open sea, and spotting for fire control of gunfire at target practices.

"The dirigible which I directed to be constructed in this country was intended as a training ship for the education of officers and men of the Navy in the handling of this type of aircraft. There were practically no manufacturers in this country that were capable of constructing dirigibles. The placing of an order for a dirigible in this country was intended to develop that industry, so that we would not have to depend upon foreign countries for dirigibles. The constructors of this dirigible have met with difficulties. There has been some delay in the delivery, but in the early spring this dirigible should be in operation at the Aeronautic Station, Pensacola. A spherical balloon is already there, and is to be used in the preliminary training of officers and men for handling dirigibles. The hydrogen plant for dirigibles and balloon work is rapidly reaching completion, and will be ready by the time that we are ready for balloon operations.

"The plans of a kite balloon, which, it is believed, may be necessary for Naval use, have been under consideration for some time. It has been hard to find designers and constructors who are familiar with the development of this type of aircraft. It is now hoped that by spring one of these aircraft will be on hand for use.

"I feel that the large amount of preliminary work required for the development of an air fleet for our Navy has been accomplished, and in the near future we will add to our Fleet aircraft that will be equal to or better than what any other country now has. Having gained this advantage, we will maintain it and increase our air fleet until it is fully adequate to all our requirements."

U.S. LABORATORY OPEN TO PUBLIC

MANY will be agreeably surprised to learn that the Government Wind Tunnel in the U.S. Experimental Model Basin at the Washington Navy Yard may be used for private tests under certain conditions.

A description of the tunnel was published in AERONAUTICS for January 26.

For testing a model of an aeroplane or single surface at a constant speed of 40 or 50 miles an hour, with angles of incidence varying from -4 to $+20$ degrees, and computing the lift and drift, and positions of the resultant air forces, and plotting same; also a test at one angle of incidence, with speeds ranging from 30 to 70 miles an hour; the charge is approximately \$50.00.

Models should not be over 36 in. in width, and may be made either of wood or metal. If made of wood it is best to have the wings made of laminated wood strips about 1 in. in width.

Persons desiring tests made should indicate the extent of tests desired, and estimate will then be supplied to them of the cost of making same. Before the work is done they are required to deposit a certified cheque for the estimated cost of the work. In all cases the actual cost is charged, and if there is any balance remaining from the deposit it is returned to them.

FIRST AEROPLANE STOCK TRADED IN WALL STREET CURTISS ORDERS

New York, January 10

CURTISS Aeroplane and Motor Co. common stock was the feature of the trading on the curb market to-day, and was sold "as is and when issued." This is the first aeroplane stock to be traded in on stock exchanges—at least, as far as America is concerned. Nearly 23,000 shares changed hands. The stock opened at 50 and closed at 57, the highest point reached being 58. The asking price was 60 at closing. The common stock has no par value.

The \$6,000,000 (£1,200,000) of 7 per cent. cumulative preferred stock is being offered for public subscription at par, with a bonus of 25 per cent. in common stock. The \$3,000,000 (£600,000) of 6 per cent. notes are being offered at par with a bonus of 10 per cent. in common stock. At least a majority, and possibly all, of the preferred and common shares will be put in a voting trust, of which Mr. Curtiss and a representative of the bankers will be voting trustees. It is proposed to continue the voting trust for five years from date of organisation.

Wm. Morris Imbrie and Co. are managers of the syndicate which has been formed to underwrite the securities of the new company. The underwriting syndicate has already been closed, having been fully subscribed.

For the eleven months ending November 31 the profits of the Curtiss companies were \$1,786,412 (£357,300), and it is estimated that for the balance of the year 1915 the total profits will be \$400,000 (£80,000) greater than the amount just mentioned. Up to October 31 the production for 1915 totalled some \$6,000,000 (£1,200,000) worth of planes and motors. By October 31, 1916, the profits are expected to be around \$7,000,000 or \$8,000,000 (£1,400,000 to £1,600,000).

The 6 per cent. notes, totalling \$3,000,000 (£600,000), are dated January 1, 1916, and mature at the rate of \$1,000,000 (£200,000) a lot on January 1, 1917, April 1, 1917, and July 1, 1917, respectively. These notes are callable at 102½ and accrued interest.

The 7 per cent. cumulative preferred stock, \$6,000,000 (£1,200,000) will be callable until January 1, 1918, at 105 and accrued dividend, and thereafter at 110 and accrued dividend. After the payment of all the notes a sinking fund at the rate of \$300,000 (£60,000) a year is to be established from earnings for the protection of the preferred stock. No dividend is to be paid on the common shares unless accrued requirements as to payment of preferred share dividends and sinking fund shall have been met or provided for. No dividend is to be paid on the common shares (so long as any of the preferred shares are outstanding) greater than the amount of \$8 per common share per annum, unless the sinking fund shall at the same time have been increased beyond the annual amount stated by an amount equal to any excess over such dividend of \$8 per common share.

On the basis of estimated profits, it is seen that the notes could be paid off with interest for the full term, dividends on the preferred stock divided, a sinking fund created, \$8 a share on the common stock paid, and then a balance of about \$1,000,000 could be added to sinking fund or paid in added dividends on common stock. At \$8 profit per common share the investment at the highest it has sold thus far (January 13, \$60) would yield a return of 13 per cent.

Some 400 160 h.p. motors will have been shipped abroad for the ninety days ending March 15, 1916. The Midvale and Driggs-Seabury companies are now supplying suitable steels quite as good as the German metal, which has been used heretofore.

A new motor of 320 h.p. has undergone exhaustive tests in the presence of British engineers. The "America" type has been superseded by a triplane dreadnought now in course of erection, which will span 133 ft., be 68 ft. in length, and weigh, including hull, planes, equipment, and armament, 21,450 lbs. It will have a radius of 750 miles on 4,750 lbs (700 gallons) of petrol.

The Company now has on its books foreign government business under order for 1,050 machines, with extra parts, motors, etc., of which 250 have already been delivered. This order is without cancellation feature or duration as to time. The unfilled portion of this order for completion in 1916 should amount to approximately \$13,000,000 (£2,600,000). The orders for 1916 were received after the aeroplanes delivered in 1915 had been accepted and in practical use. On completion of this order it is believed that additional foreign government orders will be placed which will absorb the entire producing capacity of the plant, which is about 1,500 machines and engines per annum at present. The company has good prospects for business from Russia, Spain, Italy, Norway, Sweden, China, Japan, South America, and the United States.

The Curtiss plant is said to be the largest manufacturer of flying machines in the world, and the only American concern at present manufacturing machines in quantity.

At the beginning of the war the Curtiss machines invariably carried the 90 h.p. OX motor. The latest model now being made by the company is driven by six of these engines.

The new owners of the Wright Co. have had nothing to say on the patent suit, and it is predicted by some that the suit will not now be prosecuted.

The following notice from a New York daily will be of interest:

We Specialise In

Curtiss

Aeroplane

Common Stock

Descriptive Circular on Request

GWYNNE BROS.

26 Broad St., N.Y. Phone 3232 Broad

COLLIER TROPHY AWARDED BURGESS

THE Robert J. Collier Trophy, awarded annually for the greatest achievement in aviation in America, the "value of which has been thoroughly demonstrated by use during the preceding year," has been given for 1915 to W. Starling (sometimes called "Startling") Burgess for his development of the Burgess-Dunne machine, called in newspaperdom the "fool-proof" aeroplane.

The first award was given to Glenn H. Curtiss in 1911 for his development of the hydro-aeroplane.

In 1912 Curtiss again received the award for the development of the flying boat.

Orville Wright was awarded the trophy for 1913 for demonstration and development of his automatic stabiliser, although he at the time disclaimed its adoption in general practice.

In 1914 Elmer A. and A. Lawrence Sperry, father and son, received the award for their development of automatic control through the gyroscope.

Inglis M. Upperco, head of the Aeromarine Plane and Motor Co., interested in the Newark velodrome, the Cadillac agency in Newark and New York and other little things like this, has given a hydro-aeroplane to the Naval Militia of New Jersey.

RANDOM REMARKS

XXXV.—THE LONELY LIFE By ARTHUR LAWRENCE

Illustrated by ERNEST COFFIN

MY own inclination has always been for the lonely life, of retirement for meditation—and so on. It is true that I have engaged in an unsuccessful contest with that inclination. It was Dion Calthrop who once told me that I ought to write a book under the title of "The Simple Life—and How to Avoid It." I was a bit overcome, and absent-mindedly paid for the lunch. Yet, faithful are the wounds of a friend. The fact is that my existence has been a rather patchworky effort. I am fond of children, and it has always been a relief to me that they reciprocate. I have been horses and bears and king of the castle, and everything that the ingenuity of children can invent for the torture of adults. I don't know how many families I have supported or helped to support. Certainly since

set their caps at such altitudes, and have refused so many eligibles that their good looks have left them before the Prince Charming arrived, so that, in course of time, they have had the bitter punishment of reading Herrick from the point of view of an old maid. Occasionally one may come across some genial old gentleman, who has so guarded himself against the wiles of the fair sex that he finds himself with no children to lisp their sire's return and no recalcitrant youth to write home for money. If you meet such an one and ask him what he is doing he will reply "killing time," and finds that a very troublesome business. Myself, it is possible that I have rather overstayed my leave of absence. After nearly two years of retirement from the world and its concomitants, my hand is reaching out for the "Matrimonial Herald," or "Times," or whatever the means of intercommunication are called. If I were free to select, or, in other



THE SIMPLE LIFE, AND—

I began to punt round for a livelihood, in my 'teens, there has not been a single year when I have not had some other human fragment as my partial or entire responsibility. Yet, I have occasionally gone to the expense of chambers in some gloomy old inn, that I might have the horrors of solitude, engaging in self-analysis, denying myself all pleasures, harmless or otherwise, and may have come out from my ascetic retirement a more indifferent man than when I went in. There is one thing to be said for this jack-in-the-box business that, when you emerge from your solitude, your friends have the shock of "the man that came back," and you have the interest of studying your old companions from the point of view of your erstwhile austerity.

Of course the hermitage idea may be carried too far. I believe there have been beauteous maidens who have



—A POSSIBLE ALTERNATIVE

words, if I had the courage of my convictions, I should probably yearn to lay my uncouth personality and fabulous income at the feet of some bright, bouncing girl who has not yet sophisticated herself out of her own hoydenish charm; but the Eugenists and other cranks, who are always better able to mind the business of others in a more masterly manner than their own, would object. If I do not retain my independence it will be sacrificed to those who are painfully wiser than me and who will provide me with someone fat, fair and forty, whose habits will clash with my own, and whose future is almost confined to the past.

In fact, the question arises whether, assuming that you cannot find your ideal, it is better to have no company, or associate with those of whom you do not wholly approve. Permanent loneliness cannot be justi-

fied. It is merely playing at being a rogue elephant. I am quite in sympathy with Dickens's somewhat rough treatment of his unwashed hermit. Many of the minor saints of the Roman Catholic Church seem to me worthy of no better fate than the barren fig tree. They were withered up and only fit for the furnace. They were like men-hating women. They simply cumbered the earth. It is impossible to be independent. We cannot live to ourselves. We are subject to the tender mercies of humanity from the cradle to the grave. We are as much a nuisance to others in our going off as we were when we arrived.

No, I think if we must choose of two evils, the risk of doubtful companionship is less than the other. If

we are really superior people we can get around and busy ourselves in the frightfully easy job of elevating our fellows. If we find that, contrariwise, they are dragging us down to their level, it may be that our own characters have not been on such a secure elevation as we imagined. And, indeed, phantom virtue is not worth the having. It is only in the rough-and-tumble with struggling humanity that we can measure ourselves and test our own strength. My own notion of "getting out of it all" for a space seems to me capable of some defence, but if the time is too prolonged it is apt to get gruesome. Even at forty-five it may not be too late for me to make some nice woman tired of the earth and its vanities. There ought to be some agency for bringing lonely people together.

MODEL AEROPLANES—XXIV.

By F. J. CAMM

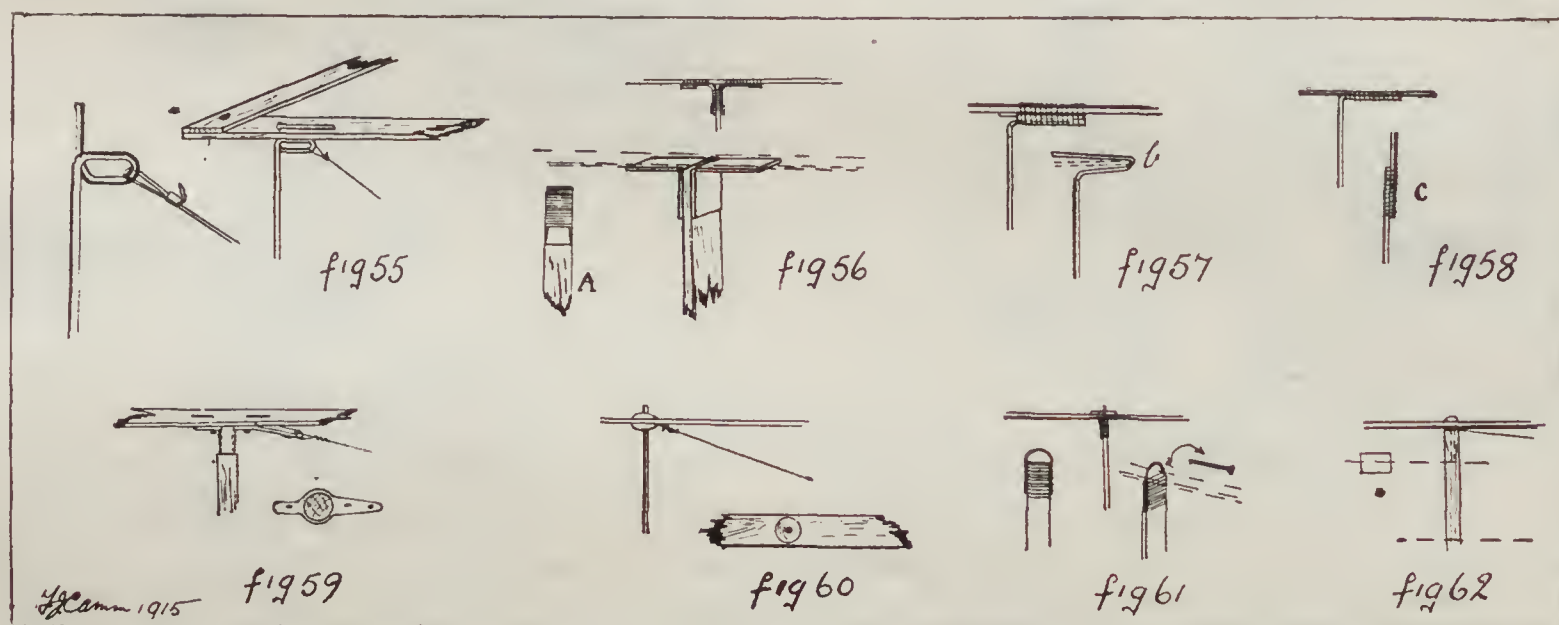
MY last article included sketches of the attachment of biplane or superposed surfaces to the fuselage, and while dealing with this detail it will be relevant to show some methods of making and fixing the struts which stay the wings. For the wing tip I do not think anything more suitable than hard drawn brass wire could be used. It is sufficiently rigid to fulfil its purpose, and at the same time yields should the wing tip come into contact with any object, thus rendering the possibility of a damaged wing improbable.

In Fig. 55 a combined strut and bracing eye is drawn. It is made by pulling the wire round a piece of metal of a suitable cross-section, which should be secured in the vice. The top portion must be formed quite squarely to the

plates, and in front (or rear) elevation the strut in place. Either birch or hickory could be used for the struts. If cross-bracing is to be used it would not be necessary to turn the plates back over the binding of that portion which engages with the strut, as the bottom of them could be drilled to provide an anchorage for the bracing.

With wire planes the struts can either be attached as drawn in Fig. 57 or the next figure. Fig. 57 shows that a socket of brass tube is soldered to the wire edge of the plane. It receives a strut, shaped on the ends as at *b*, which is sprung into the tube, when the position of the wire is as indicated by the dotted line. This forms an easily detachable method of fitting the strut.

Alternatively, if the struts are required to be permanently



stanchion, so that it beds home parallel to the wing spar. The end of the strut is passed through the wing spar and bent down flush to it, and to bind sufficiently to prevent the strut from swivelling. The truss bracing passes through the eye, and is secured by having its end turned back over a small ferrule cut from by-pass tubing, as indicated in the enlarged detail shown to the left of Fig. 55.

Where wood is used for the inter-struts it is usual to utilise fishplates to fix them to the spar. A portion of each plate must be left unbound for the purpose of being turned back over the binding, as at *a*, to prevent it from pulling through the binding. Each fishplate should also be lightly sunk into the strut by being centre-punched; this secures the strut.

Fig. 56 illustrates, in perspective, the position of the fish-

fixed, they could be affixed as shown in Fig. 58. Here each strut is made in two pieces, each a quarter of an inch longer than the desired gap. Each half is bound and soldered to the wing *before* this latter is covered; they are finally brought together bound and soldered as at *c*. Each portion being cut longer than is necessary provides for half an inch lap.

The strut socket shown in the next figure is suitable for larger models. A piece of tube is cut, filed, and bent to the shape indicated, two pins well clinched securing it to the wing spar, the strut itself being held in place by the tension of the bracing. It will, of course, require to be of round cross-section where it fits into the socket; the other portion should be of ichthyoid or stream-line form.

Fig. 60 shows another method of using wire stanchions

or struts to wooden wings. A cupped washer is soldered to the stanchion on each side of the wing spar. The bracing passes round the stanchion between the washer and the wing.

Another neat strut attachment is that given in Fig. 61. Loops of wire are bound to each end of the strut, and these fit into slots cut in the wing spars; the latter should not exceed $\frac{1}{8}$ in. by $\frac{1}{16}$ in. in dimensions.

The struts are locked into position by the cotter shown in the drawing. Owing to the weakening of the spars resultant upon slotting them, this form of attachment can only be advocated for large models.

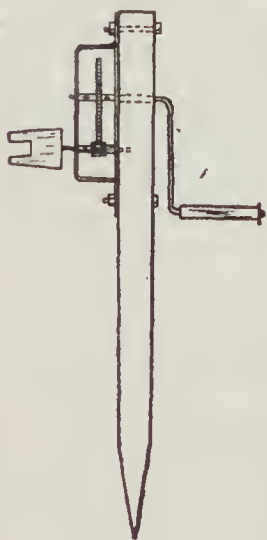


Fig. 63

The last figure illustrates perhaps the simplest method of fixing wooden struts. A pin is merely driven through the spar into them, a spot of seccotine being smeared over the ends of them, so that they adhere to the wing.

It has occurred to me that some of the readers who have constructed the models described in the opening chapters of these articles may be unacquainted with the apparatus used to wind them. Accordingly I show in Fig. 63 a winder designed, I believe, by Mr. E. W. Twining. As will be apparent from the drawing, it consists of a stump of ash, tapered off at the lower end to facilitate its being forced into the ground. To the top of the stump is bolted the gearing. The gear and pinion could be requisitioned from an old clock, and must bear a teeth ratio of 6:1 to one another; that is to say, one turn of the handle gives six revolutions to the propeller. The shaft running through the pinion is flattened out on its end, and the wooden

chuck (cut from ash) driven on. The gear casing should be of sixteen-gauge brass, and care should be taken when drilling the holes in it to make the gears a nice mesh. The rest of this figure will, I believe, be self-explanatory.

NOTE.—We are pleased at all times to reply to queries relating to model aeroplanes and kindred matters. To ensure a reply in the following week's issue, queries must reach this office not later than first post Monday morning.

REPLIES TO CORRESPONDENTS

G. W. F. G. (Scarborough).—No information is to hand regarding a 15-ton machine; apparently this is one of the numerous rumours created through the foreign Press. (2) Our opinion is that the floating tail type of model is an extremely successful one. The position of the main plane does not matter so very much, providing that the centres of pressure and gravity of the complete machine are coincident. This rule is vital. (3) We cannot supply the dimensions of the Mann monoplane; perhaps a reader will oblige? (4) Let the pitch of the 10-in. propellers be double the diameter. (5) Yes; eight strands of $\frac{3}{4}$ by $\frac{1}{16}$ rubber should be sufficient.

F. J. M. (Leeds).—We shall deal at some length in a subsequent issue with the construction of the wheels you require. We do not altogether agree with your remarks concerning scale models, as a flight of only 70 yards does not permit of a very deep study of the laws of flight. Flying models and scale models are two distinct branches of model aeroplaning. No advantage accrues from combining them. In our opinion more useful work can be accomplished by experiment with the various units of the model rather than with a complete machine. We are returning to this point subsequently.

(To be continued)

THE FOKKER MYTH

British Headquarters, France.

January 23.

What's the latest from home? Is it really true that the German airmen are 'getting the bulge' upon our flyers? This is the topic of the moment out here, and the newspapers of the last few days provide a sufficient explanation of the reason why. I take it that what Tommy in the trenches is asking, his relatives, *i.e.*, the entire British public, will also be wondering. And so, although I dealt fairly fully with the subject in my last despatch, I must plead the interest which has been aroused as my excuse for returning to it. I would begin by giving, not on my own responsibility, but on the strength of what I have gathered from those best qualified to speak, a definite negative to the question in the opening paragraph. The Fokker has not been sprung upon our Royal Flying Corps as a surprise. Its existence has been known for months. It has been in service for many weeks. But this, it is undoubtedly true to say, that the aviators who operate these machines have been displaying an increasing degree of confidence, no doubt due to their perception of the qualities of their planes. The qualities are: (1) The advantage of very rapid climbing, (2) a speed of at least 100 miles an hour under reasonably favourable conditions, (3) a very effective type of gun mounting, and (4) successful shooting.

It is scarcely relevant to the question of the success of the Fokker to say that we possess a type of aeroplane which forms a satisfactory response to it. The British official *communiqués* for some weeks past have admitted a considerable measure of achievement by these German machines. This is the one fact which we have to consider at the moment. *En passant*, I would point out that our *communiqués* probably form an imperfect record of the degree of damage which British airmen have inflicted upon the enemy flyers. The wording is always studiously guarded where there is the least possible room for doubt as to the completeness of the result. The term "was brought down" is only employed when such a success is beyond question. "Was seen to descend" is the description applied to many cases in which there is no sanguine expectation to conclude that real mischief has been inflicted. The fact is, that our air service is too confident in its own efficiency to want to overstate its claims.

We established the aerial initiative almost from the beginning of the war; we have steadfastly maintained that initiative through-

out. I emphasise this fact at the risk of repetition, because a clear appreciation of it is so important to a correct understanding of the aerial situation. The Fokker, as Mr. Tennant briefly explained a few days since, does all its work in a defensive rôle. Therefore, the "bags" which the German airmen have been claiming do not in any way stand for the passing of our air supremacy, but for the more successful resistance to our policy of ceaseless activity.

This brings us to the interesting discovery of how small is the increased toll which has been levied by the German airmen, relatively regarded, as may be gathered when I say that, as the result of a little calculation I have made, I find that the proportion of casualties which are worth reporting at all in our air service do not represent more than two per cent. of the number of flights made in normal weather.*

One does not need to be gifted with any particular prophetic quality to forecast that the success of the Fokker aeroplane, which has heretofore mainly rested on unequal conditions, will before long be effectually countered. Losses we must always be prepared to face in fighting a determined and resourceful enemy, but, in the air, these will not continue to be losses due to inequality in the matter of the craft employed. We have a machine which is capable of meeting the Fokker on its own terms. The "personal ascendancy" of our airmen may be confidently trusted to do the rest.—*Reuter's Special Service*.

[We may point out with legitimate pride that this story bears out in every single point the views expressed in our last issue, which, by the way, were printed in the daily Press throughout the country.—ED.]

RECALLED TO RAID ENGLAND

The correspondent of the *Daily Mail*, who was present at the dinner at Nish given in honour of the Kaiser, in an account of his experiences in the new German "Balkan Express," states:—"The other passengers in my compartment were two German flying men in Turkish uniform, who, with ten others that were in the train, had been suddenly recalled from Constantinople to take part, it was said, in forthcoming air raids on England."

* See page 77 in this connection.—ED.

AIRCRAFT IN ACTION

OFFICIAL INFORMATION

ENGLAND

January 24—German Seaplane at Dover—Issued by the Press Bureau: "A German seaplane passed over Dover at 4 p.m. to-day (January 24). It was engaged by all anti-aircraft guns and pursued by two British machines."

January 25—Air Raid on Dunkirk—Admiralty Report: "A report received from Dunkirk states that two aeroplanes dropped bombs on Dunkirk about six o'clock this morning (January 25). A German seaplane was forced to the water by a British machine north-east of Nieuport about eight o'clock this morning."

January 25—Aerial Supremacy Maintained—Aircraft on both sides have been active. We have maintained our supremacy.

January 26—Twenty-Seven Hostile Machines Encountered—Yesterday (January 25) twenty-seven hostile aeroplanes were encountered and three captive balloons were attacked. Two aeroplanes and two balloons were forced down. All our machines returned safely.

FRANCE

January 24—Aircraft Direct Artillery—The fire of our artillery regulated by aeroplane observation, seriously damaged a German battery.

January 24—Bombs on Enemy Encampment—During the night our aeroplanes bombarded the line Anizy-Laon and the establishment at Nogent l'Abbesse. This morning (January 24) one of our air squadrons of seven machines dropped about twenty shells on the enemy's encampments at Houthulst and Middelkerke.

January 25—Raid on Dunkirk—This morning (January 25) two German aeroplanes dropped fifteen bombs on Dunkirk and suburbs. Five persons were killed and three wounded.

[See German Report]

January 26—Zeppelin Raid—Last night (January 25) a Zeppelin dropped some bombs on the villages in the district of Epernay, but the material damage was insignificant. The dirigible was cannonaded by a section of our motor guns at the moment when it was returning to its lines.

January 28—Raid on Freiburg—As a reprisal for the bombardment by a Zeppelin of the villages in the region of Epernay on January 25, one of our dirigibles bombarded Freiburg in Breisgau during the night of January 27-28. Eighteen bombs of 155mm. and twenty of 90mm. were dropped on the station and the military establishments, which suffered serious damage. [See German version].

January 30—Zeppelin Raid on Paris—A Zeppelin flew over Paris and district last night (January 29) about 10 o'clock and dropped several bombs. According to the latest accounts 23 people were killed, and over 30 more or less seriously injured. Many houses were wrecked.

The night was particularly favourable for an air raid. There was no moon, the sky was cloudy, and a mist overhung the capital.

Although the military authorities were aware soon after 9 o'clock that enemy aircraft was making for the capital, Parisians only received their first warning that something extraordinary was happening at 10 o'clock, when the electric lights were suddenly extinguished. A few minutes after, firemen drove through the streets in motor-cars sounding the *Garde-à-vous*. The great crowds which thronged the streets received the warning with calm. In the meantime numerous searchlights scoured the murky sky and the lights of the aeroplanes of the entrenched camp could be seen in all directions. Not more than five minutes after the alarm had been given a series of formidable explosions shook the city, and in two minutes the attack was finished. No fewer than 13 bombs were dropped, all of which fell within an area of about half a mile.

According to official information, the airship, flying at a height of 10,000 feet, had managed to elude the searchlights and the aeroplanes of the entrenched camp, which were up in a few minutes after the military authorities had received warning of the hostile airship's approach, and, aided by the mist, managed to reach the city. In spite of the adverse conditions, five French aeroplanes located the raider and one was able to approach and attack him, which probably accounts for the haste with which the bombs were dropped and his precipitate retreat. On account of the mist, the batteries of the forts were not able to do very efficacious work.

The bombs, which were of a very powerful character, all fell in a quarter inhabited mainly by working-class people. One completely pierced the roadway and tube of the Metropolitan Railway near one of the stations. Fortunately a train, filled to overflowing, had just left the station. Two of the bombs struck the same house, injuring many inhabitants. Another bomb reduced a five-storey house to a mass of debris, killing four and injuring eight of the inmates.

January 31—Second Raid on Paris—It is officially announced that a German airship appeared over Paris shortly after 10 o'clock last evening (January 30). It was fired upon by batteries and was attacked by aeroplanes. The airship dropped a number of bombs, which so far as is known at present did no damage. At 11.15 p.m. the alarm was over, and lights were again turned on.

According to earlier messages, the alarm was given in Paris at 9.50 p.m., and all lights in the city and the suburbs were extinguished. Bugles were blown at 10 o'clock, and all precautions taken. The Prefect of Police announced that a Zeppelin was reported to be coming from the north.

RUSSIA

January 25—Bombs on Dvinsk—Yesterday (January 24) an enemy aeroplane dropped two bombs on Dvinsk, killing a woman. Near the village of Smilschnischki, west of Lake Boguin, we repulsed a German attack against our outpost barrier. The enemy is again using balloons to scatter proclamations in our camps.

January 26—A Zeppelin Cruise—In the district of Riga, on both banks of the Dvina, and at Dvinsk German aeroplanes were active. A Zeppelin flew from Jacobstadt in the direction of Riejitza and returned via Dvinsk. On the Galician front on the Upper Strypa four enemy balloons were sent up over our lines in order to light up our positions. Two of these balloons caught fire in the air, and in falling produced a dazzling light.

January 27—German Aerial Activity—On the western front German aeroplanes continued to make frequent flights over the Riga and Dvinsk regions, where they dropped bombs.

January 28—Zeppelins Active in Dvinsk Region—During the bombardment of Shlock, German aeroplanes, while regulating the artillery fire, threw bombs at several points. Several Zeppelins dropped bombs in the region of Dvinsk.

January 30—Work of Observation Balloons—From two observation balloons it was seen that enemy guns and caissons were hit.

DARDANELLES

January 29—Aeroplanes v. Destroyers—Turkish Official: On Thursday (January 27) our aeroplanes dropped bombs on a monitor, which unsuccessfully fired in the direction of Akbach. Three of the bombs hit the vessel's after-bridge, setting it on fire, so that it was only with difficulty that she was able to get from Kephalos Bay to the Island of Imbros. Our aeroplanes pursued the hostile warship and three hostile destroyers which came to the rescue of the monitor, and once hit a destroyer. One of our aeroplanes also dropped several bombs on a big enemy transport in Kephalos Bay.

EGYPT

January 25—British Aerial Reconnaissance—The British troops marched from Mersa Matru on January 22 to engage the enemy, who had been located by aeroplane reconnaissance.

ITALY

January 27—Austrian Attack on Ala—Along the whole front artillery activity continued, supported by aeroplanes. Enemy aeroplanes dropped bombs on Ala, in the Lagarina valley, and on Roncegno and Borgo, in the Sugana valley, without doing any damage.

BALKANS

January 24—Raid on Monastir—French Official: "A squadron of thirty-two French aeroplanes bombarded the enemy cantonments of Ghevgeli and Monastir. At the latter place over 200 bombs were dropped by our machines."

January 29—Raid on Bulgar Camp—French report: A squadron of fourteen French aeroplanes yesterday (January 28) carried out a magnificent raid on the German and Bulgarian camp at Pazarli, north-west of Lake Doiran, producing great panic and doing considerable damage. All the machines returned to the base unscathed.

AUSTRIA

January 29—Two Enemy Machines Destroyed—Three Brought Down—An enemy aerial squadron of eleven aeroplanes yesterday (January 28) appeared over the Strypa front (in Galicia). Two were destroyed by our artillery fire and three were forced to land behind the enemy lines.

GERMANY

January 24—Raids on Metz and Monastir—An enemy squadron dropped bombs on Metz, one of which fell on the residence of the Bishop and one in the courtyard of a hospital. Two civilians were killed and eight injured. One aeroplane of the squadron was shot down after an aerial battle. The occupants were taken prisoners. Our aviators dropped bombs on the railway and military establishments behind the enemy's front. On this occasion they retained the upper hand in a series of aerial battles. An enemy aeroplane squadron, which ascended from Greek territory, dropped bombs on Bitolj (Monastir). Several inhabitants were killed or injured.

[See French Reports in last issue]

January 24—Raid on Dover—On the night of January 22-23 one of our seaplanes dropped bombs on the railway station, barracks, and docks at Dover. On the afternoon of the 23rd instant two of our seaplanes dropped bombs on the airship sheds at Hougham (West Dover). The outbreak of a heavy fire was ascertained beyond doubt.

[See English Reports]

January 25—Attack on Nancy—A German aerial squadron attacked the military works and flying station at Nancy and the factories at Baccarat. Near St. Benoist, north-west of Thiaucourt, a French biplane, with its occupants, fell into our hands.

January 25—Berlin Admits "Important Damage" at Monastir—A French air squadron, composed of forty-five machines, dropped bombs on Monastir, and caused important damage to the railway station, the barracks, the railway lines, and the munition depots.

January 26—Raid on Loo, Dixmude, and Béthune—Seaplanes attacked a military establishment near La Panne (on the Belgian coast, between Nieuport and Dunkirk), and aeroplane establishments at Loo, south-west of Dixmude, and Béthune.

January 28—German Claims—The German official reply to Mr. Tennant's statement in the House of Commons (printed in another column), circulated by the Wireless Press, runs as follows: Statements have been made in the English House of Commons regarding the results of aerial attacks, the best answer to which is furnished by the following compilation of our and the enemy losses in aeroplanes. Since our *communiqué* of October 6, 1915, viz., in the period since October 1, 1915, the following German aeroplanes have been lost on the Western front: In aerial battles seven of our aeroplanes have been shot down by enemy anti-aircraft guns and eight are missing, making fifteen altogether. Our opponents on the Western front lost in the same period forty-one aeroplanes in aerial battles, eleven were shot down by our anti-aircraft guns, and eleven were lost owing to forced landings within our lines, making altogether sixty-three. In these figures are included only enemy machines which it has been ascertained with certainty have fallen into our hands.

January 28—The Raid on Freiburg—Yesterday evening (January 27) after ten o'clock, two enemy aviators dropped five bombs on Freiburg in Breisgau, causing material damage only. Nobody was injured. Being the Kaiser's birthday, the theatre was full of people, who, however, quietly remained inside the building until all danger was over.

January 29—French Aeroplane Brought Down—Raid on Freiburg—Near Apremont a French aeroplane was brought down by the fire of our anti-aircraft guns. The pilot was killed, and the observer, an officer, injured. The aerial attack on Freiburg on the night of January 28 has caused but little damage. One soldier and two civilians were wounded.

[See French Report]

FROM OTHER SOURCES

ENGLAND

January 28—Bombs on Steamer—An enemy aviator's attack on the Wilson liner Carlo was described at Hull by Captain Cawcutt and Chief Officer Payne. The vessel had arrived from the Mediterranean on Wednesday, January 26, and had taken on board the Dover pilot, when, shortly after she passed the Gull light, at a quarter-past 3 in the afternoon, she was attacked by an aeroplane flying directly overhead. Six bombs were dropped, but they all fell clear of the Carlo. The vessel was immediately put on a zigzag course and successfully evaded the attack. The aeroplane then turned on a westerly course and dropped four bombs among the ships anchored in the Downs, but without causing any damage. The machine went off eastwards at high speed at 3.30. Chief Officer Payne said the bombs exploded as they reached the sea and displaced such a mass of water that the ship was thrown on her beam-ends. They could not hear the engines of the aeroplane.

FRANCE

January 24—Bombs on Nancy—The latest bombardment which the town of Nancy has suffered took place this morning (January 24) between seven and eight o'clock and caused no serious damage. Two persons were injured, one rather seriously and the other only slightly. Later in the morning three enemy aeroplanes flew over the town and dropped several bombs, which caused insignificant material damage, but slightly wounded two people. Darts were also dropped, to which were attached a "proclamation" warning the population of a fresh bombardment on the occasion of the Kaiser's birthday a few days hence.

BELGIUM

January 24—Bombs on Ghent—The Germans are taking special measures to guard against air attacks behind their fronts in Belgium and Northern France. All civilians living in the vicinity of depots and other military buildings are being ordered to leave their houses. Last week twenty-seven French and British aeroplanes flew over Ghent and dropped bombs on the city and several important points in the neighbourhood.

January 25—Bombs on Belgian Coast—Allied aviators displayed great activity, dropping bombs on many enemy positions in the Belgian coast region.



A CURTISS BIPLANE STARTING OUT ON A RECONNAISSANCE

BALKANS

January 23—Allied Raid on Monastir—The largest air raid yet carried out in the Balkans was made by the French this morning (January 23) on Monastir. Starting at seven o'clock, thirty-two aeroplanes from the aerodromes near Salonika flew off in regular squadrons. There has recently been some concentration of troops, both German and Bulgar, at Monastir, though their numbers are most variously estimated. The chief object of this concentration is probably the use of shelter against the winter weather which the town buildings afford. The flight to Monastir took just over two hours. The weather was fine, but at nine a violent wind sprang up. Some of the aircraft were gunplanes, and bombarded the German-Bulgarian headquarters with their guns. Others dropped shells and bombs. Buildings known to be used as hospitals were avoided. As the last squadron, pitching in a boisterous north wind, but flying in regular order across the blue sky, circled over the town, its pilots saw black clouds of smoke rolling up from places where the bombs from the leading planes had fallen. All the French machines were vigorously shelled by the enemy batteries round the town, but everyone had returned unhurt by noon to Salonika, and on the way back dropped about 100 bombs they had remaining over on two or three villages near Ghevgeli where the Bulgarian troops are encamped.

January 24—Aeroplane Machine Guns—The Montenegrins have been suffering a good deal from the Austrian aeroplanes, which have been flying for some weeks past as low as 1800ft., using machine-guns on soldiers in open towns and villages. Eighty men were killed by this means at Niksitch in one day and thirty at San Giovanni di Medua.

January 29—Fire in Bulgarian Camp—The second of what promises to be a series of most effective air raids was carried out yesterday morning (January 28), when French aeroplanes shelled and bombed a Bulgarian camp of 600 tents at Pazarli, north of Doiran, and 50 miles from Salonika. They threw and fired projectiles on the camp, setting many of the tents on fire, and were able to take photographs showing columns of smoke rising from the camp. The whole squadron returned to Salonika without loss. Marvellous accuracy of fire is claimed for the naval guns carried by some of the French aeroplanes which recently bombarded Monastir. These guns, the exact calibre of which is kept a secret, can be aimed both obliquely and vertically.

GERMANY

January 26—Noted German Aviator Killed—The following news from Berlin, sent on January 26 through the wireless stations of the German Government, has been received by the Wireless Press:—The two German aeroplane squadrons which shelled Nancy, as reported by the German Headquarters, dropped 150 bombs on the town and fortress of Nancy. The German aviation branch takes this opportunity of expressing its regret at the loss of Lieutenant Boehme, who was cited several times in the Main Headquarters reports. Lieutenant Boehme fell down with his machine at Enisheim, in Alsace, and was killed immediately.

The *Vossische Zeitung* says that Lieutenant Boehme (whose death was reported on January 26), in the air attack on Nancy used a Fokker machine.

January 27—Airship Wreckage Found—Telegrams from Norway state that among the large number of mines washed ashore lately



A 100 H.P. DE HAVILLAND PUSHER SCOUT BIPLANE

January 24—Aeroplanes Attack Royalty—It is learned that throughout the flight of the King and Queen of Montenegro from Podgoritza to San Giovanni di Medua, aeroplanes hovered over them dropping bombs. As the Montenegrins had no guns with which to reply the aeroplanes came down so low they were able to use their machine-guns on the Royal party.

January 25—Bombardment of Ghevgeli—It is learned from Salonika to-day (January 25) that sixteen French aeroplanes have just effected a new bombardment of the Bulgarian positions at Ghevgeli. In addition to considerable material damage it is known there were over one hundred victims. Despatches from Salonika state that the French air-flotilla which bombarded Monastir returned in two sections, the one bombarding Ghevgeli on the home journey, the other Kavadar (in Serbia, about thirty miles north of Ghevgeli), on which one hundred bombs were dropped.

January 26—Continued Balkan Air Raids—Allied aeroplanes continue their daily bombardment at various points along the whole front in Macedonia, and long convoys of enemy wounded have been observed making their way to their hospital bases.

January 26—Monastir Air Raid—It is now known that Monastir suffered very heavily from the Allies' air raid on January 23, and it is reported that 70 persons were killed.

Private telegrams from Salonika state that a French biplane was compelled to descend owing to a broken wheel. The Greek authorities have been instructed to afford the French airmen every facility in order that they may be able to continue their way back.

["Broken wheel" sounds rather unconvincing.—ED.]

along the coast between Christiania Fjord and the Swedish border are some large aircraft bombs, measuring 2 ft. in diameter. Quantities of wreckage indicating the recent destruction in this vicinity of one or more airships have also been found. Torpedo-boats and coastguards are removing the bombs and mines. A close investigation is being made by the authorities.

HOLLAND

January 27—Zeppelin over Holland—Yesterday (January 26) a Zeppelin airship, passing along the Dutch-Belgian frontier, and coming from the direction of Bruges, was fired at by Dutch frontier guards. The airship thereupon turned back.

THE FOKKER MYTH

(From the Paris correspondent of the *Daily Telegraph*)

Owing to wild rumours spread about the German Fokker aeroplanes, it is interesting to note the competent opinion expressed by Senator Cazeneuve, member of the Parliamentary Army Commission. He says: "I can affirm that the Fokker is nothing more than a Morane machine, built of metal like the Rep machine, with Rep landing apparatus, machine-gun placed according to Garros's design, and rotary engine copied from ours, which we have lately done away with, not altogether wisely, I think.

"My inference is that the Germans are not slow to take advantage of our inventions. Let us follow the same method whenever they invent anything useful."

[Instead of cabling from Paris, it would have saved considerable trouble to have read our last issue.—ED.]

IMPERIAL AIRCRAFT FLOTILLA

The Punjab aeroplane fund has now reached £70,000, and £45,000 has already been remitted to the Secretary of State for India for the first 20 aeroplanes, which are all named after various native States and Punjab districts.

The Overseas Club announce, through the Secretary of State for the Colonies, the following further gifts to the Imperial Aircraft Flotilla:—

- No. 42—Pretoria—70 h.p. biplane, costing £1,500, presented by the people of Pretoria, through the Pretoria branch of the Overseas Club.
- No. 43—Ashanti—70 h.p. biplane, costing £1,500, presented by the Chief of Ashanti, through the Crown Agents for the Colonies.
- No. 44—Shanghai Race Club—70 h.p. biplane, presented by the members of the Shanghai Race Club, through Mr. H. H. Read, Shanghai. (Cost £1,500.)
- No. 45—Accra—70 h.p. biplane, presented by the residents of Accra, through the Crown Agents for the Colonies. (£1,500.)
- No. 46—Akin-Abuakwa—70 h.p. biplane, presented by the residents of Akin-Abuakwa Division of the Gold Coast, through the Crown Agents for the Colonies. (£1,500.)
- No. 47—Rhodesia—No. 3—70 h.p. biplane, costing £1,500, presented by the people of Rhodesia, through the British South Africa Co.
- No. 48—Poverty Bay, New Zealand—Henri Farman biplane, costing £2,039, presented by the Poverty Bay District of New Zealand.
- No. 49—South Australia—100 h.p. Gnome-Vickers gun-mounted biplane, costing £2,250, presented by the people of South Australia, through the Governor, Lieutenant-Colonel Sir H. L. Galway, D.S.O.
- No. 50—Nigeria—No. 2—70 h.p. biplane, costing £1,500, presented by the people of Nigeria, through the Governor, Sir F. D. Lugard, C.B., D.S.O.
- No. 51—Lady Ho Tung, Hong Kong—70 h.p. biplane, presented by Lady Ho Tung, Hong Kong. (£1,500.)
- No. 52—Sir Robert Ho Tung, Hong Kong—70 h.p. biplane, presented by Sir Robert Ho Tung, Hong Kong. (£1,500.)
- No. 53—Shanghai Exhibition—100 h.p. Gnome-Vickers gun-mounted biplane, presented by the residents of Shanghai, through Mr. H. H. Read, Shanghai. (£2,250.)

ASHANTI GIFT OF AN AEROPLANE

A further sum of £1,526 has been subscribed by the people of Ashanti for the purchase of an aeroplane for presentation to the Royal Flying Corps through the Overseas Aircraft Fund. This is the fifth aeroplane to be presented by the people of the Gold Coast and its dependencies.

STATEMENTS IN PARLIAMENT

HOUSE OF COMMONS

January 25—*Air Fights in France*—Colonel Greig (Renfrewshire, W.) asked the Under-Secretary for War whether he could give any additional information in regard to recent air fighting on the Western front.

Mr. Tennant: I have received the following telegram:

"The following is the information with regard to the working of the Royal Flying Corps during the last four weeks:

- "1. Number of machines lost by us, thirteen.
- "2. Number of enemy machines brought down, certainly nine, and probably two in addition.
- "3. Number of bombing raids carried out by us, six.
- "4. Number of bombing raids carried out by enemy, thirteen.
- "This comparison is modified by the fact that we have used 138 machines, including escorts, for bombing raids, while enemy have used approximately twenty.
- "5. Number of our aeroplanes which have crossed enemy lines, 1,227.
- "6. Number of German aeroplanes which have crossed our lines, estimated at 310.

"The last figure is determined by reducing actual anti-aircraft observations to probable number of individual machines.

"It is pointed out that practically all aircraft fighting takes place over or behind the German lines, and owing to the prevailing strong west wind German machines hit can plane home-wards, while ours often cannot.

"For this reason it is not possible to give an accurate comparison of the relative loss. Hostile machines are reported as 'brought down' or 'driven down' when they are seen to fall to the ground uncontrolled, but the enemy probably suffers many casualties of which our officers, who are scrupulously careful in their reports, are not certain.

"In many cases the Germans break off combats and descend rapidly to their own lines. In such cases no claim of causing a casualty is made."

Sir J. H. Dalziel (R., Kirkcaldy): Has the right hon gentleman received any complaints from flying men at the front that

they are asked to perform tasks when the weather is entirely unfavourable?

Mr. Tennant: No.

Kent Coast Raid—Viscount Duncannon (U., Dover) asked the Under-Secretary for War whether it was not a fact that in the three hostile air raids upon a locality on the east coast of Kent none of our aircraft was engaged; whether adequate precautions existed to enable our air service to deal with such visits, and, if so, why their failed to operate in the case of twice-repeated raids on the same locality in the course of twenty-four hours.

Mr. Tennant: The question only reached me this morning, and I have been unable to obtain full information. I understand, however, that there were not three raids as stated, but two, one of which took place during the night and one during the day.

The hostile aircraft were fired at by anti-aircraft guns both on land and sea. Four military aeroplanes and two seaplanes went up in pursuit, but the raiders were too far ahead to be overtaken.

January 25—*London's Dark Streets*—In reply to Sir C. Kinloch-Cooke (U., Devonport),

Mr. Brace (Under-Secretary Home Office) said the police were doing all in their power to secure the safety of the public in respect of motor traffic after dark. The imposition of a speed limit was impracticable, but the provisions of the Motor Car Act of 1903 were sufficient to enable the police to take action in all cases of dangerous driving.

January 26—*Air Raids on the Kentish Coast*—Mr. Tennant, answering questions by Mr. Bennett-Goldney (Canterbury, U.) respecting the recent visits of hostile aircraft to the Kentish coast, said that on the occasions on which British aeroplanes ascended to attack the enemy the lapse of time between the sighting of the enemy aircraft and the ascent of the British machines was that required to prepare the machines for flight. The report that enemy aircraft were seen cruising about in broad daylight for two hours is destitute of truth.

Mr. Bennett-Goldney: Ought not these aeroplanes to be kept ready for flight?

Mr. Tennant: They are kept ready for flight, but you cannot put an aeroplane into the air by merely touching a button.

NEW MEMBER

Mr. Warwick Brookes, the new member for the Mile End Division of Tower Hamlets in succession to Colonel the Hon. H. Lawson, who has succeeded to the peerage as Lord Burnham, took the oath and his seat, being introduced by Sir E. Cornwall (Bethnal Green, N.E., L) and Mr. G. Terrell (Chippenham).

AIR DEFENCE OF LONDON

A deputation of London members waited upon Lord Kitchener at the War Office on the subject of the protection of London from raids by aircraft on January 27. Mr. Balfour was also present. The following is an official report of the proceedings:—

The deputation was introduced by Sir Frederick Banbury; other speakers being Mr. Dickinson, Mr. Burdett-Coutts, and Mr. Wiles.

The Ministers explained to the deputation that the difficulties in arranging a satisfactory scheme of metropolitan anti-aircraft defence had in the past been due to a deficiency in anti-aircraft material—a deficiency that was felt not merely in London but in the fleets and in the armies at the front. Every effort was being made to remedy the shortage, and with good results. A great development of metropolitan defence had been effected since the last air raid; and the development was still continuing. Progress (it should be noted) was not confined to the increase and organisation of anti-aircraft artillery, under the able superintendence of Sir Percy Scott. It was to be found also in the improved arrangements for defence by aeroplanes.

In the common task of organising defence, the War Office and the Admiralty had worked most harmoniously together. But it had for some time been felt that unity of control was desirable; and as this could only be fully carried out if the whole work of defence was undertaken by the Army, all Admiralty responsibilities were in progress of being transferred to the War Office. The transference, it was hoped, would be complete within the next three weeks.

The members of the deputation were:—Right Hon. Sir F. G. Banbury, Right Hon. N. H. Dickinson, Right Hon. Sir G. Reid, Right Hon. T. Lough, Lord Claud Hamilton, Sir H. Samuel, Sir W. Pearce, Sir P. Magnus, Mr. Burdett-Coutts, Mr. H. Percy Harris, Mr. T. Wiles, Mr. J. D. Gilbert, Mr. G. H. Radford, Mr. A. W. Yeo, Mr. J. Boyton, Mr. Warwick Brookes, Mr. W. S. Glyn Jones, Mr. E. A. Strauss, Mr. A. Strauss, Mr. G. A. Touche, Mr. H. G. Chancellor, Mr. J. S. Fletcher, and Mr. Hector Morison.

MENTIONED IN DESPATCHES

The following officer of the Royal Flying Corps appeared in the list of officers recommended for gallant service in the field published in the *London Gazette* of January 27, 1916:—

Borton, Capt. (temporary Major) A. E., D.S.O., Royal Highlanders.

CASUALTIES

ROYAL NAVAL AIR SERVICE

KILLED

January 23

Ward, Probationary Flight Sub-Lieut. Clinton G. Flight Sub-Lieut. Clinton G. B. Ward, Royal Naval Air Service, was killed while flying on January 23. He was born on July 1, 1895, and was the only son of Mr. and Mrs. Ward, of Fairlight, Elm Bank Gardens, Barnes. He was educated at Colet Court and at St. Paul's School, and joined the Honourable Artillery Company as a private on the outbreak of war, and proceeded to the front with the 1st Bn. in September, 1914. He was slightly wounded, but served with the Expeditionary Force until September, 1915, when he returned to England, and was granted a commission in the Royal Naval Air Service. His father is Assistant Superintendent of Ordnance Stores at the Admiralty.

MISSING

January 23

Ferrand, Flight Lieut. James B. P., D.S.O. Flight Lieut. James B. P. Ferrand, D.S.O., R.N., previously reported as missing on January 23, returned to duty on January 25. Flight Lieut. Ferrand went up from Nieuport on Sunday morning on an ordinary reconnaissance. He experienced some engine trouble about midday and was obliged to make a descent on the sea. He managed to keep afloat until Monday evening, when he was fortunately rescued by a Danish steamer and taken to Ramsgate.

ROYAL FLYING CORPS

DIED

January 19

Roberts, 15714 Second Class Air Mechanic C. D.

DIED OF WOUNDS

January 18

Jenkins, Second Lieut. R. B., South Wales Borderers and R.F.C.

January 20

Johnson, Second Lieut. H. R., Royal Flying Corps.

WOUNDED

Cave, Second Lieut. E. H. P., A.S.C. and R.F.C.

January 21

Lawrence, Capt. G. A. K., D.S.O., R.F.A. and R.F.C.

Johnson, Lieut. W. S. F., Leicester Yeomanry and Royal Flying Corps.

MISSING

January 18

Hayward, Lieut. C. O., Lincoln Regt., 7th Bn., and R.F.C.

Wadham, Capt. V. H. N., Hampshire Regt. and R.F.C.

Watts, Lieut. W., R.F.C.

January 20

Brooking, Second Lieut. W. A., R.F.A. and Royal Flying Corps.

Wilson, Lieut. C. B., 10th Hussars and Royal Flying Corps.

Piper, 470 Serg. N. V.

PREVIOUSLY OFFICIALLY REPORTED MISSING, NOW UNOFFICIALLY REPORTED KILLED

January 19

Cobbold, Lieut. E. F. W., 7th Cheshire Regt. (T.F.) and Royal Flying Corps.

Lieut. Edgar Francis Wanklyn Cobbold, Cheshire Regt. and Royal Flying Corps, killed in action on January 12 in France, was born in November, 1895. Educated at King's College Choir School, Cambridge, King's School, Ely, and Marlborough, he was apprenticed to the Fine Cotton Spinners' Association. Before the outbreak of war he obtained a commission in the Cheshire Regt., Territorial Force, and in April, 1915, he was gazetted to the Royal Flying Corps. Lieut. Cobbold was the second son of the Rev. Robert Russell Cobbold and Mrs. Cobbold, of the Rectory, Hitcham, Ipswich.

Hathaway, Second Lieut. S., Royal Flying Corps.

Kingdon, Second Lieut. L., Worcestershire Regt. and Royal Flying Corps.

PREVIOUSLY OFFICIALLY REPORTED MISSING, NOW UNOFFICIALLY REPORTED WOUNDED AND PRISONERS

Formilli, Lieut. G. C., R.G.A. and Royal Flying Corps.

Gray, Lieut. K. W., 3rd Wilts Regt. and Royal Flying Corps.

Kemp, Second Lieut. H. T., Cheshire Regt. and Royal Flying Corps.

Somervell, Second Lieut. W. E., L.N. Lancs Regt. and Royal Flying Corps.

PREVIOUSLY OFFICIALLY REPORTED MISSING, NOW UNOFFICIALLY REPORTED PRISONER

Russell, Lieut. A. L., Royal Flying Corps.

OFFICER PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR

January 23

Porter, Capt. G. T., Royal Field Artillery and Royal Flying Corps.

CANADIAN CONTINGENT
PREVIOUSLY OFFICIALLY REPORTED MISSING, NOW UNOFFICIALLY REPORTED KILLED

Field, Lieut. C. V. G., 4th Canadian Infantry Bn., attached Royal Flying Corps.

APPOINTMENTS

ROYAL NAVAL AIR SERVICE

Temporary Lieut. (R.N.V.R.):

E. J. B. How, entered as Probationary Flight Sub-Lieut., temporarily, with seniority of January 22, and appointed to the *President*, additional, for R.N.A.S.

W. A. Daniell, entered as Probationary Flight Sub-Lieut. (temporary), with seniority of January 26, and appointed to the *President*, additional, for R.N.A.S.

Temporary Sub-Lieuts. (R.N.V.R.):

R. J. M. de St. Leger, V. R. Gibbs, H. L. Everitt, and J. T. Chitty, all entered as Probationary Flight Sub-Lieuts., temporarily, with seniority of January 22, and appointed to the *President*, additional, for R.N.A.S.

W. H. Ralphs, promoted to Temporary Lieut., with seniority of January 29.

J. A. Cameron and K. M. Smith, both entered as Probationary Flight Sub-Lieuts., temporarily, with seniority of December 30, and appointed to the *President*, additional, for R.N.A.S.

Flight Lieut.:

R. J. J. Hope Vere, appointed Acting Flight Commander, with seniority of January 24.

Flight Sub-Lieuts.:

R. H. Mulock and G. H. Beard, both promoted to Flight Lieut., with seniority of January 1.

Temporary Flight Sub-Lieut.:

F. G. D. Hards, promoted to Temporary Flight Lieut., with seniority of January 1.

The undermentioned have been entered as Probationary Flight Sub-Lieuts. (temporary), with seniority as follows, and all appointed to the "President," additional, for R.N.A.S.:

M. H. Stephens, A. E. E. Blackburn, G. H. Burland, C. Butterworth, W. McN. Gray, and P. G. McNeil: December 30.

B. P. Chase, C. W. Spencer, P. H. Hepburn, N. Wallis, and N. H. Fletcher: January 25.

J. A. M. Allan, entered as Probationary Flight Sub-Lieut. (temporary), with seniority of January 25, and appointed to the *President*, additional: January 29.

C. O. Palmer, J. A. V. Echevarri, J. E. Maxwell, and W. R. Abbott, all entered as Temporary Sub-Lieuts. (R.N.V.R.), with seniority of January 25, and appointed to the *President*, for R.N.A.S.: January 27.

The following have been entered as Probationary Flight Sub-Lieuts. (temporary), with seniority of January 29, and all appointed to the "President," additional, for R.N.A.S.:

D. F. Ellis, J. R. Ross, H. Wild, T. G. Culling, G. M. F. O'Brien, L. H. Brett, and J. S. T. Fall.

Chief Petty Officer Percival Wilcox Owen, from the Royal Naval Air Service, to be Second Lieut. the King's (Shropshire Light Infantry) (on probation).

Flight Sub-Lieuts. Redford H. Mulock and George H. Beard to be Flight Lieuts.: January 1, 1916.

Temporary Flight Sub-Lieut. Frederick G. D. Hards to be temporary Flight Lieut.: January 1, 1916.

Temporary commissions have been granted as follows:

P. G. Burton, as Lieut. (R.N.V.R.), with seniority of January 25, and B. M. Dodds, as Sub-Lieut. (R.N.V.R.), with seniority of January 26, and both appointed to the *President II.*, additional, for R.N.A.S.

Late Temporary Sub-Lieut. (R.N.R.):

D. C. Woods, entered as Probationary Flight Sub-Lieut. (temporary), with seniority of January 28, and appointed to the *President*, additional.

ROYAL FLYING CORPS

The following appointments are made:

Squadron Commander, from Flight Commander:

Major D. W. Powell, Northern Regt.: January 12.

Squadron Commanders, from Flight Commanders, and to be Temporary Majors whilst so employed:

Capt. A. C. E. Marsh, R.A., and Lieut. (temporary Capt.) P. H. L. Playfair, R.A.: January 12.

Squadron Commander, from Equipment Officer:

Temporary Major S. E. Smith, Gloucestershire Regt., T.F.: December 15.

Squadron Commanders, from Equipment Officers, and to be Temporary Majors whilst so employed:

Capt. A. Christie, R.A., and Capt. R. H. Collier, Special Reserve: December 15.

Wing Adjutant:

Temporary Capt. the Hon. W. C. W. Egerton, General List, vice Capt. A. Marshall, D.S.O., 28th Light Cavalry, I.A., and to retain his temporary rank whilst so employed: December 1.

Flying Officers:

Temporary Capt. I. U. D. Truman, A.S.C., and to be transferred to the General List; Capt. J. E. Dixon-Spain, Hampshire Regt., and to be seconded: Temporary Second Lieut. A. Cunningham-Reid, R.E., and to be transferred to General List: December 15.

Capt. S. Grant-Dalton, Yorkshire Regt.; Lieut. V. A. Albrecht, Manchester Regt., and to be seconded; Lieut. C. W. E. Cole-Hamilton, Royal Scots, and to be seconded; Temporary Lieut. W. W. Carey-Thomas, General List; Temporary Second Lieut. G. H. Gordon, R.A., and to be transferred to General List; Temporary Second Lieut. L. J. Mann, A.S.C., and to be transferred to General List; Second Lieut. F. G. W. Marchant, Royal West Kent Regt., and to be seconded; Second Lieut. J. R. Taylor, Rifle Brigade, and to be seconded: January 6.

Second Lieuts., Special Reserve, G. L. Godden, W. A. Harvey, F. A. Garlick, E. Henty, and G. C. Mills.

Temporary Second Lieut. S. E. Adams, R.A., and to be transferred to General List; Second Lieut. W. G. Pender, Special Reserve.

Temporary Second Lieut. G. A. Garveys-Gadd, R.A., and to be transferred to General List; Temporary Second Lieut. R. H. Peck, East Surrey Regt., and to be transferred to General List; Second Lieut. W. R. D. Shaw, Essex Regt., T.F.: January 13.

Equipment Officer:

Second Lieut. J. Dickson, South African Engineer Corps, and to be Temporary Capt. whilst so employed: December 24.

Equipment Officers, from Assistant Equipment Officers:

Capt. R. Hall, Cheshire Regt., Special Reserve: December 15.
Temporary Capt. C. G. Martyn, Monmouthshire Regt., T.F.;
Temporary Lieut. C. W. M. Ludgate, General List, and to be temporary Capt. whilst so employed: January 15.

Assistant Equipment Officers:

Second Lieut. J. G. Francis, South African Aviation Corps: November 26.

Second Lieut. S. R. Capon, Liverpool Regt., T.F.: December 23.

Second Lieut. W. H. Day, Hampshire Regt., and to be seconded; Temporary Second Lieut. G. M. Goode, Bedfordshire Regt., and to be transferred to the General List: January 11.

Second Lieuts., Special Reserve, Charles F. J. North, Edwin N. Layton, George J. Williams, John T. Spittle: January 11.

Temporary Lieut. W. B. Hellard, General List, to be temporary Capt. while employed with Kite Balloon Sections: January 14.

The appointment of H. Levy to a Second Lieutenancy, notified in *Gazette* of December 23, 1915, is cancelled as from January 22, 1916.

To be Temporary Second Lieuts. for Duty with R.F.C.:

Pte. E. L. Pearson, from Royal Warwickshire Regt.: September 20.

Pte. S. F. Browning, from Royal Fusiliers (City of London Regt.), and Sapper W. S. Earle, from 6th Field Co., 2nd Canadian Divisional Engineers: October 25.

Gnr. L. A. C. Helbert, from 17th Bn., Canadian F.A.: October 28.

Pte. H. B. Hurst, from Royal Fusiliers (City of London Regt.): November 15.

Pte. W. F. L. Castle, from R.A.M.C. T.F.: November 17.

Lance-Corp. K. S. Henderson, from 5th Australian Light Horse: November 25.

Pte. T. F. Bassett-Smith, from Royal Sussex Regt., T.F.: December 6.

Corp. A. E. S. Story, from R.E., and Sapper A. A. Wilson-Walker, from 1st Field Co., Australian Engineers: December 7.

Pte. E. I. Gibbons, from Royal Fusiliers (City of London Regt.): December 20.

Gnr. C. E. W. Foster, from 1st Australian Field Artillery; Corp. J. Goodlee, from 10th Australian Light Horse; Dvr. N. R. Pomeroy, from R.F.A., T.F.; Serg. L. L. Richardson, from 6th Australian Light Horse: December 28.

Serg. R. G. Meech, from Motor Machine Gun Service, Canadian Artillery: January 3.

Pte. E. J. Radcliffe, from London Regt., T.F.: January 15.

SPECIAL RESERVE

To be Second Lieuts. (on probation):

C. R. Huggins: December 6.

Stanley F. Vincent: December 7.

Sydney F. Heard, A. de B. Brandon, E. T. Williams, G. S. Hall, C. W. Blain, C. H. Coxe, M. H. Thunder: December 8.

C. P. W. Jolliffe: December 20.

S. A. Alder and T. L. Collins: December 23.

E. W. Vaughan: December 27.

R. F. Tindall: December 29.

P. C. Garratt: January 1, 1916.

W. C. Stringer: January 3.

S. G. Frost: January 17.

D. K. Sworder, E. H. Cooper, C. Holland, L. A. Price, P. Arbon, A. Gordon-Bond, J. M. Marks, T. G. Holmes, and J. L. Horridge: January 21.

E. D. L. Davies: January 24.

Second Lieuts. (on probation) are confirmed in their Rank:

W. A. Harvey, G. L. Godden, E. Henty, F. A. Garlick, C. F. J. North, E. N. Layton, and G. J. Williams: January 21.

Appointment of H. M. MacCarthy to a Second Lieutenancy, notified in *Gazette* of January 18, is cancelled as from January 21.

Second Lieut. (on probation) Wilfrid E. Marsden is removed from the Army, the King having no further occasion for his services: January 29, 1916.

PROGRESS AT THE FLYING SCHOOLS

Grahame-White School—Civilian School: Straights with instructor—Baragar, Barret, Box, Eichelbrenner, Grasset, Hathaway, Hillaby, Leigh, Matthews, Parkinson, Sandys, Verguilt, F. Williams, and S. Williams. Circuits with instructor—Hallet and McClaughrie. Instructors during week—Biard, Hale, Manton, Pashley, Russell, and Winter.

The London and Provincial School—Instructors—W. T. Warren, M. G. Smiles, C. M. Jacques, H. Sykes, and W. T. Warren, jun. Pupils doing rolling—Creaghan, Palethorpe, Aldous, Starey, Scott, Moore, Brown, Egelstaff, Rimer, de Goussencourt, Vilain XIII., Pulford, Clement, Dawson, and Houba. Pupils doing straights—Darwin, Vertongen, Verbessem, and Lambert. Pupils doing circuits and eights—Stevens, Loomes, and Snow. Royal Aero Club Certificates have been taken this week by Messrs. E. F. Loomes and W. Snow; both these gentlemen are civilians at present.

The Hall School—Another good week for Hall School pupils. With C. M. Hill and H. F. Stevens—Redford, Evans, Ridley, Nicolle, Smith, Sepulchre, Ormerod, Cooke. Certificate taken by Manley in excellent style. With J. Drew—Thom, Neal, Lieut. Cooke, Millburn, Wooley, Chapman. With A. Chave—Rayne, F. Smith, Rochford, Mahoney, Warsick, Rand, Hucklesby. Machines in use—Hall Government-type tractors.

PATENT INFORMATION

This list is specially prepared for AERONAUTICS by Messrs. Rayner and Co., Registered Patent Agents, of 5, Chancery Lane, London, from whom all information relating to Patents, Designs, Trade Marks, etc., can be obtained gratuitously.

LATEST PATENT APPLICATIONS

544 A. O. Brewster. Apparatus for use in connection with aircraft. 12/1/16.

608 C. J. F. Newman-Gudgeon. Seaplanes. 14/1/16.

583 C. A. Johansson. Stabilisation of aircraft. 13/1/16.

SPECIFICATIONS ACCEPTED

24,048 Gillett (Constantarus). Aeroplanes, hydroplanes, and the like.

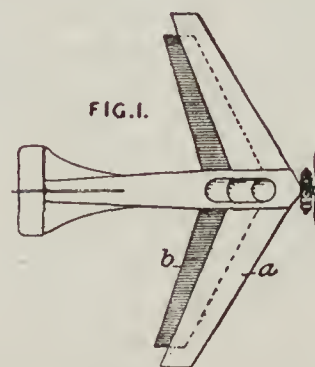
186 Macmechen and Fox. Airships or dirigible balloons.

SPECIFICATIONS PUBLISHED THIS WEEK

9,354 Lazarte. Anti-aircraft guns and mountings therefor.

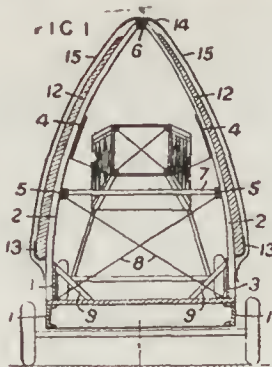
LATEST PUBLISHED ABSTRACTS

7,660 "Aeronautics." W. Rittberger, 38, Kurfurstendamm, Charlottenberg, Germany. An aeroplane is supported on

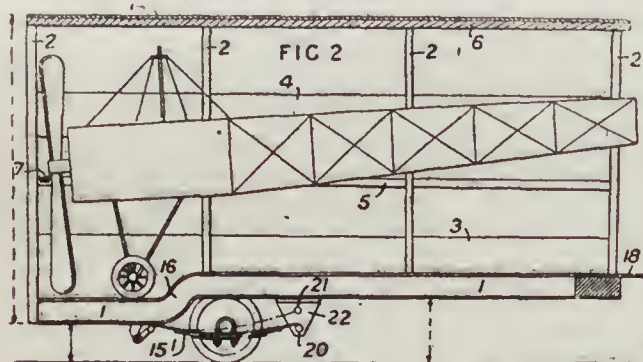


two parallel, arrow-shaped, superposed surfaces *a*, *b*, displaced relatively to one another in the direction of flight

20,117 "Vehicles for Transporting Aerial Machines." J. Sloan, 17, Rue du Louvre, Paris. The body of a vehicle for transporting an aeroplane, comprises a framework built up of half-hoops, 2 of ogival form connected by longitudinal beams 5, 6, and planks 3, 4, the body of the aeroplane being carried within the framework, and the wings 12



resting against the outside of the hoops upon the brackets 13. The whole is adapted to be covered by an awning 15, resting on a plate 14, fixed to the top beam 6. The framework is stiffened by a cross-piece 7, cross-stays 8, and struts 9. The longitudinal members 1 of the chassis frame are bent downwardly towards the rear as shown at 16, Fig. 2, and in order to reduce the total height when the whole is loaded on a railway truck, one end of each spring



15¹ carries a pin adapted to be removed from the hole 20 to the hole 21 in the bracket 22 fixed to the chassis. The vehicle is adapted to be coupled at 18 to a separate limber.

Full copies of the specifications can be obtained from Messrs. Rayner and Co., at the price of 1s. each.

SHELL-FIRE FOR AIR RAIDERS

In the case of an air raid on London there is a grave danger to the public from falling fragments from the shell-fire which will be used against the raiders. It is known that the measures taken for the protection of London have been greatly increased, and there is therefore a corresponding addition to the perils of those who are in the streets at the time. The Commissioner of Police has accordingly felt it necessary to issue, in the interests of the public, the following emphatic warning as to the necessity for taking cover:—

"The increase in the offensive protection against hostile aircraft recently provided in the Metropolitan District makes it the more necessary for the public, on the occasion of air raids, to take cover, so as to be sheltered from falling fragments of shells.

"On a previous occasion a warning regarding this was published, which the Commissioner of Police now deems it advisable emphatically to repeat."

THE INSTITUTION OF AUTOMOBILE ENGINEERS

The next meeting of the Institution of Automobile Engineers will be held on Wednesday, February 9, 1916, at the Royal Society of Arts, John Street, Adelphi, W.C., at 8 p.m., when Mr. W. D. Williamson will read a paper entitled "Petrol Engines for Commercial Vehicles."

Cards of invitation to the meeting may be obtained on application to the Secretary of the Institution, at 28, Victoria Street, Westminster, S.W.

MILE END ELECTION RESULT

The result of the Mile End Election on January 25 was:—Mr. Warwick Brookes, 1,991; Mr. N. P. Billing, 1,615.

R.F.C. OFFICERS PRISONERS OF WAR

Mr. Gerard, the American Ambassador in Berlin, reporting upon his visit to the Prisoners of War Camp at Ingolstadt in Bavaria, states:—

"Ingolstadt is surrounded by ring forts or earthworks, and I visited one fort, No. 9. Here I found four British officers, Lieutenant Alsop, London Scottish, Captain Wilson and Lieutenant Scholefield, Royal Flying Corps, and Lieutenant Kemble, Suffolk Regiment. They had no complaints to make.

"The officers are allowed to walk on the ramparts and in a large court. They have sleds and slide down the ramparts and may play football in the court-yard. The relations between Commandant and prisoners are excellent. There is a well-

furnished canteen, and anything may be ordered even from Berlin or Munich.

"Captain Wilson is suffering from shock, having fallen in an aeroplane from a great height."

ENGINEERS FOR THE ROYAL NAVAL AIR SERVICE

The Royal Naval Air Service issues the following:—"Skilled engineers, especially those with experience of internal combustion engines, are required for deferred entry or immediate service."

RECRUITS FOR ROYAL FLYING CORPS

An officer and a contingent of men arrived at Birmingham on January 27 to assist in raising 10,000 men required for the Royal Flying Corps. According to present arrangements only men from Group 10 upwards in Lord Derby's scheme are eligible, and, generally speaking, they must be skilled mechanics. Men who can drive motor vehicles will be given preference, but draughtsmen and clerks are stated not to be required. Men who have not enlisted and who desire to join the Flying Corps are advised to enlist under the group system, and then apply for enrolment in the Air Service.

WELL-AIMED SHOT AT ZEPPELIN

Mr. Walter Leaf, presiding on January 27 at the annual meeting of the London County and Westminster Bank, congratulated the members of the staff who had won distinctions on active service. He said that F. F. Morgan, of the Anti-Aircraft Service, had received the thanks of the Admiralty for firing the well-aimed shot which brought down the Zeppelin afterwards destroyed by bombs at Ostend.

LEGAL NEWS

R.N.V.R. OFFICER'S AFFAIRS

At the Bankruptcy Court, on January 25, George Colvin White, a lieutenant in the Anti-Aircraft Corps, R.N.V.R., described as of Park Place, St. James's Street, should have attended for public examination upon a statement of affairs showing liabilities £52,552, of which £36,431 were expected to rank, and estimated assets £30,506, but a medical certificate was produced to the effect that he was unable to appear, and the examination was adjourned for a month.

WILLS AND BEQUESTS

Montague Hayes Bythway, R.N.A.S., of Hale, Cheshire, electrical engineer, who died in St. George's Military Hospital, Malta, on active service, left £10,944.

SOCIAL

An engagement is announced between Matthew Talbot Baines, Second Lieutenant Royal Flying Corps, elder son of Mr. and Mrs. Matthew Talbot Baines, of Buckhill House, Calne, Wilts, and Flora, younger daughter of Cavaliere Roberto R. Allatini and Mrs. Allatini, of 18, Holland Park.

An engagement is announced between Captain C. W. Anstey, 24th Regiment, the South Wales Borderers, and Royal Flying Corps, only surviving son of Major W. Anstey (late H.L.I.) and Mrs. Anstey, Lismoyne, Fleet, S.O., Hants, and Dorothy Ethel (Doshie), eldest daughter of Major H. R. Westmacott, the Welsh Regiment, and Mrs. Westmacott, Belvedere Cottage, Rye, Sussex.

MESSRS. BROWN BROS., LTD.

Brown Bros., Ltd., of Great Eastern Street, London, E.C., are busy compiling a catalogue of aviation accessories, and manufacturers of these goods are invited to send particulars of new lines they would like inserted. Particulars should be addressed to Department 41a.

BURBERRYS' HALF-PRICE SALE

The period for acquiring a Burberry weatherproof top-coat, gown or suit at half-price, and thereby obviating the inconvenience of forced economy, expires at the end of February, and the number of people who have already taken advantage of this unique opportunity proves how highly it is appreciated by the public.

Burberrys' Sale Stock, consisting of nothing but their own distinctive models and cloths, is not a rummage accumulation of odds and ends collected for the annual clearing out of refuse otherwise too expensive to have either destroyed on the premises or removed through the ordinary municipal channels.

Apart from occasional shortages in particular sizes, Burberry garments are constant in design, material and workmanship, being, in fact, exactly the same on the last day of the sale as on the first. A late comer is therefore as well served as the early birds, who, in the typical sale orgy, snap up whatever is worth having with the voracity of hungry starlings long before customers of regular habits have finished their breakfast at home and braced themselves for the fray, which at Burberrys, instead of being the usual scramble and tumult, is a pleasant and leisurely transaction, conducted under the most comfortable conditions imaginable.

Catalogues of the half-price garments included in the sale, both for men and women, are obtainable on application to Burberrys, Haymarket, London, S.W.

AERONAUTICS

A WEEKLY JOURNAL DEVOTED TO THE TECHNIQUE OF AERONAUTICS

(FOUNDED 1907)

Edited by JOHN H. LEDEBOER, B.A., A.F.Ae.S.

VOL. X. No. 121 (NEW SERIES)

FEBRUARY 9, 1916

[Registered at the G.P.O.]
as a Newspaper

ONE PENNY

THE ZEPPELIN RAIDS AND PRESS PANIC

SURELY we are in danger of losing all sense of proportion. On Monday night we experienced a Zeppelin raid by numerous enemy effectives over the Eastern, North-Eastern, and Midland Counties of England. The official War Office report designates the counties involved by name. We refrain from doing so. By this time the major portion of the population of these islands is perfectly well acquainted with the amount of material damage accomplished by virtue of Zeppelin raids in general and of this industrial raid—for that is precisely what it amounts to—in particular. And the public, if there be a far-sighted mind among it, knows as well as we do that the damage to life and property was both negligible from a purely military point of view and wholly incommensurate with the effort expended.

Let us relate the tale in its bare essentials. A fleet of seven Zeppelins set forth to attack the vital industries of England, and chose for the purpose well-nigh ideal weather conditions. So far the powers that be were on their side. For there was an almost total absence of wind, the atmosphere was misty, and, if it rained in places—and, mind you, *local* rain is no bar to a Zeppelin excursion, though heavy downpours of rain or snow throughout the entire area may prove to be—the weather on the whole was ideal. Very good. Having bided their time for months past, the Huns patiently await their “selected moment”—and seize it, with the fell purpose of cowering England into submission by reason of the indiscriminate terror of the civilian population. Naturally, no inoffensive citizen enjoys the process of being bombed; of witnessing the partial destruction of his happy home, or of seeing his wife and children senselessly mutilated. Still, that was the Hun intent—to bring the pressure of frightfulness to bear on the non-fighting members of the British people in order to arouse them to a condition wherein they would compel their Government to sue for peace. Here, at least, we have one interpretation of the matter.

In cold blood let us draw our balance-sheet, and next endeavour to reduce this incident—for it is nothing else, spite the deplorable waste of innocent life—to its proper proportions. Material damage caused by the raid: hit and damaged, three breweries (would any Hun in his senses destroy his ikon?), three railway sheds, one engine shed, one tube factory, one lamp factory, and one blacksmith's shop. *Uninjured*, all docks, granaries, and munition factories. Killed, 61; injured, 101. In this twenty-ninth aircraft raid on England, the Huns have therefore succeeded in killing 266 mostly inoffensive persons, and this during eighteen months of war and with the weapon on which they relied to subdue England and the world. At the expenditure of millions of pounds they have achieved the results that would have followed the firing of a couple of high-explosive shells of large calibre into a thickly populated dis-

trict. Let the whimperers remember that a far heavier toll of life, not to mention material damage, has been levied on many a French, Belgian, or Polish village of such slight importance geographically and industrially that not one tourist in a million knew its name in days before the war. Besides, if we put the matter on a cold financial and material level, the Germans have lost in their futile attacks upon England *and as a direct result thereof*—which they can strike in no other manner—a minimum of their first-class airships, representing an initial cost of £450,000, and (far more important still) *trained* crews totalling ninety men. I have reason to believe that our intelligence service has information which would enable us to compute the Huns' loss considerably higher. My estimate is conservative, and based solely on published reports.

However, my present purpose is not to show the futility of these Zeppelin attacks, but to indicate their aim, and to demonstrate in what manner this has been frustrated. To begin with, the aim of the last raid was simply to interrupt the output of munitions and their steady outflow to the front. How ill the Huns succeeded in this avowed intention we most of us know. England's industrial activity or productivity has not suffered one jot. The question arises—why this sudden attack upon the industrial districts? I can answer with a spark of authority: the attack had been in preparation for two months past, only the favourable opportunity tarried, while, secondly, it is obvious to every student of the war—and the recent German aerial activity at the front is an infallible confirmation of this view—that a big German offensive in the Western theatre of war is impending. Hence their urgent efforts to stop our supply of munitions.

Mr. Hilaire Belloc some time ago lucidly explained that military operations are operations conducted for military purposes. It is possible that before these words of wisdom were uttered we, the general public, had not viewed the matter in this light. Possibly we thought that military operations were conducted for the sake of the war painter and the cinematograph operator. Yet it seems to me that Mr. Belloc is right. We have—though many people scarcely seem to realise the fact—entered upon a war; in fact, we are actually engaged upon it. Now a war has for its main objective the gaining of military advantage; nothing else counts in the matter save this alone. We may gain the whole colonial empire of the Huns, but if we are decisively defeated in the main theatre of war we are defeated just the same.

The curse of the war hitherto has been the interference of civilians and of inconsequent meddlers, who not only raise a cloud of self-protective dust which obscures for a time their own true delineaments, but temporarily blinds the public. So with this insensate controversy regarding reprisals.

When all is said and done, the last accusation that can be made against the Hun is to call him a fool in military matters. If they spend vast sums of money and intense preparation in raiding our shores with their expensive and singularly ineffective—I speak from the purely technical point of view—air fleet, they do not do so with the express purpose of murdering non-combatants, but in order to inflict *military* hurt. If civilians suffer in the process, so much the worse for them, according to their view. Let us imitate their example and concentrate our full energies on the military prosecution of the war.

This talk of the ethics of reprisals is, to put it plainly, bosh. If reprisals—a hateful word in the vocabulary of war, since it means precisely nothing in the military sense—are to be initiated, let purely military considerations guide and rule the question and not the vapourings of lawyers and writers to the press. In any case, let not the severely military conduct of the war be hampered constantly by profit-mongering sections of the press. Sir Evelyn Wood puts the matter concisely in a letter to the *Times*, which I beg to reproduce:—

"Officers of 'the fighting Services' being unable to write to the Press, I as the oldest midshipman, Field-Marshal, and student of war, venture to ask you to allow me to express my regret that a distinguished ex-Prime Minister should have advocated in your issue of to-day systematic reprisals for the painful loss of non-combatants in the last Zeppelin raid.

"I believe and trust that our fighting Services will never sink to such deeds of infamy; but, moreover, the arguments in favour of such policy are based on ignorance of war. Marshal Marmont, after an experience of twenty years of such a system, wrote: 'Les représailles sont toujours inutiles.'

"The Germans, however loathsome brutal their war principles may be, notwithstanding that some of their newspapers advocate the indiscriminate dropping of bombs to frighten us, are yet practical people, and would not willingly waste one air bomb after having carried it hundreds of miles in killing and maiming non-combatants.

"They, fortunately for us, in the last raid made very bad shots, their object being to destroy ships, docks, munition buildings, and war-like stores. The silence enforced on our Press as to locality of damage done is, I submit, a wise precaution against correction of the enemy's aim on future occasions."

I think this accurately represents the opinion of well-nigh every officer of our fighting Services. There is nothing to add.

Hot-air Balloons

Of all the fatuous proposals to checkmate Zeppelin raids the palm of glory must surely be awarded to the fire-balloon scheme which lately appeared in the columns of the *Daily Express*. Everyone knows the schoolboy's toy fire-balloon; well, it is not only, it appears, going to provide us with immunity from Zeppelin raids, but to wreck any marauders venturing to cross our shores. Policemen and special constables are each to be provided with a stock of fifty balloons, which are to be deposited with a local tradesman near the middle of his beat. "On the first sign of Zeppelins each man should hasten to his fire balloons and send the first up as soon as possible." An engaging picture, truly, and one to cause the stoutest-hearted Hun to blanch with fear, the atmosphere above London (or is the whole of England to be included?)—one seething, weltering mass of—paper toy balloons! In the name of all the powers that be, is there really a war on?

Allied and German Aircraft Losses

A kindly correspondent draws attention to an apparent discrepancy in two statements relating to German aeroplane losses which appeared in our last issue. The discrepancy certainly exists, nor is it—*mirabile dictu*—to be classed as a printer's error. The sin was purely an editorial one. The following are the two versions of the official German statement in question:—"The list represents figures which could be ascertained by us from enemy aeroplanes which fell into our hands." Again, farther on, another version is given: "In these figures are included only enemy machines which it has been ascertained with certainty fell into our hands." The reason for the existence of these two versions—it is im-

portant to note that they can be read so as to convey a totally different meaning—is simple enough. Both messages were emitted from German headquarters by wireless, translated and forwarded to this country by two different news agencies, each of which gave its own rendering of the German. Which of the two is correct I am unable to say, having had no means of seeing the original German version. It is unfortunately the case that inaccurate translations have ere now been published in the Press, often grossly, though no doubt unintentionally, misleading in the impression they convey.

A Mystery Solved

Amongst the hitherto unsolved mysteries of the war is the alleged equipment of part of the German fleet with guns stated by various writers, who have never seen them, to be of 17-inch bore. We had already heard of the 17-inch howitzer, but a naval gun of this calibre would certainly have been a novelty. Fortunately, I am in a position to solve the mystery until now attaching to these monster cannon. The information is derived from someone employed at the War Office. The latest Zeppelins, he states, are provided with an iron spiral staircase leading up through the centre of the hull to a solid iron platform on the top. On this platform is mounted a 17-inch gun under a revolving steel cupola, proof, like the remainder of the vessel, against aeroplane attacks. Coming from the War Office, the information, of course, must be true.

The Demand for an Air Minister

Ungrateful as it is on the whole, the rôle of the prophet is not devoid of compensations—when, that is, his prognostications come true. There has suddenly arisen in a large section of the popular Press a demand, sometimes verging upon the hysterical, for the creation of an Air Minister. Thus Mr. J. L. Garvin in the *Observer*:

"The nation's strong opinion, we are convinced, is that there should be in the Government an Air Minister taking charge of the whole subject, just as there is a Naval Minister or a Secretary of State for War. It is impossible, in our view, that either Mr. Balfour or Lord Kitchener, much less both together, can deal adequately with this very novel, technical and complicated subject and at the same time discharge efficiently their other duties. Who should be Air Minister? He ought to be a man of the most vigorous freshness of mind and the most intense executive capacity."

And again:

"If an Air Minister full of mental freshness and executive energy is required, as we think, let Major Churchill be recalled from the trenches. His appointment in such a capacity was mooted months ago, and we wish it had been made."

Now, it may come as a revelation to the public to-day that the creation of an Air Minister was first mooted by me in the columns of the *Daily Telegraph* in March, 1913, but then the public's memory is short and journalism ephemeral. Since then I have never ceased to urge the vital necessity of appointing a head of the air services responsible to the Government and thence to the nation only to be laughed at for my pains. Thus on December 27, 1913, I wrote:—

"Before efficiency is possible a series of new essential features must be introduced into the general scheme of organisation. The first of these is the creation of a single central Air Department with a responsible head."

Mr. Garvin is at any rate to be congratulated upon his journalistic honesty in acknowledging that the proposal to place Mr. Churchill at the head of our aerial organisation was mooted some months ago. His memory does not play him false, for the suggestion first appeared in *AERONAUTICS* of May 26 of last year:—

"At the time of writing rumours are current that Mr. Winston Churchill may find no place in a reconstructed Cabinet. Much as we should deplore this on national grounds, we would urge with the utmost possible emphasis, based on personal knowledge of his work in the past, *that no one better than he could be found to fill, whatever its ultimate designation, the post of first Minister of Aerial Defence.*"

And here, having definitely established priority for the benefit of posterity, I may be permitted to leave the subject with the single remark that nothing has since occurred to lead to any alterations in my views.

J. H. L.

THE EFFECT OF WIND ON THE SPEED OF TRAVEL

By JOHN H. LEDEBOER, A.F.Ae.S.

WIND affects the direction and velocity of flight of all forms of air-craft much in the same manner as an ocean current acts upon sea-going vessels, whether propelled by steam or sail. But in the case of air-craft the effect is far more intense and general, since there is practically no such thing as a perfect calm; nor, save in isolated cases such as those of the Monsoon and Trade winds, have the air-currents any regular or defined direction or velocity. It is therefore impossible as a general rule to forecast the precise duration of a flight over a given course, since, though the direction and speed of the wind at the starting point may be known, wind currents of other directions and speeds may be encountered at different parts and elevations during the journey.

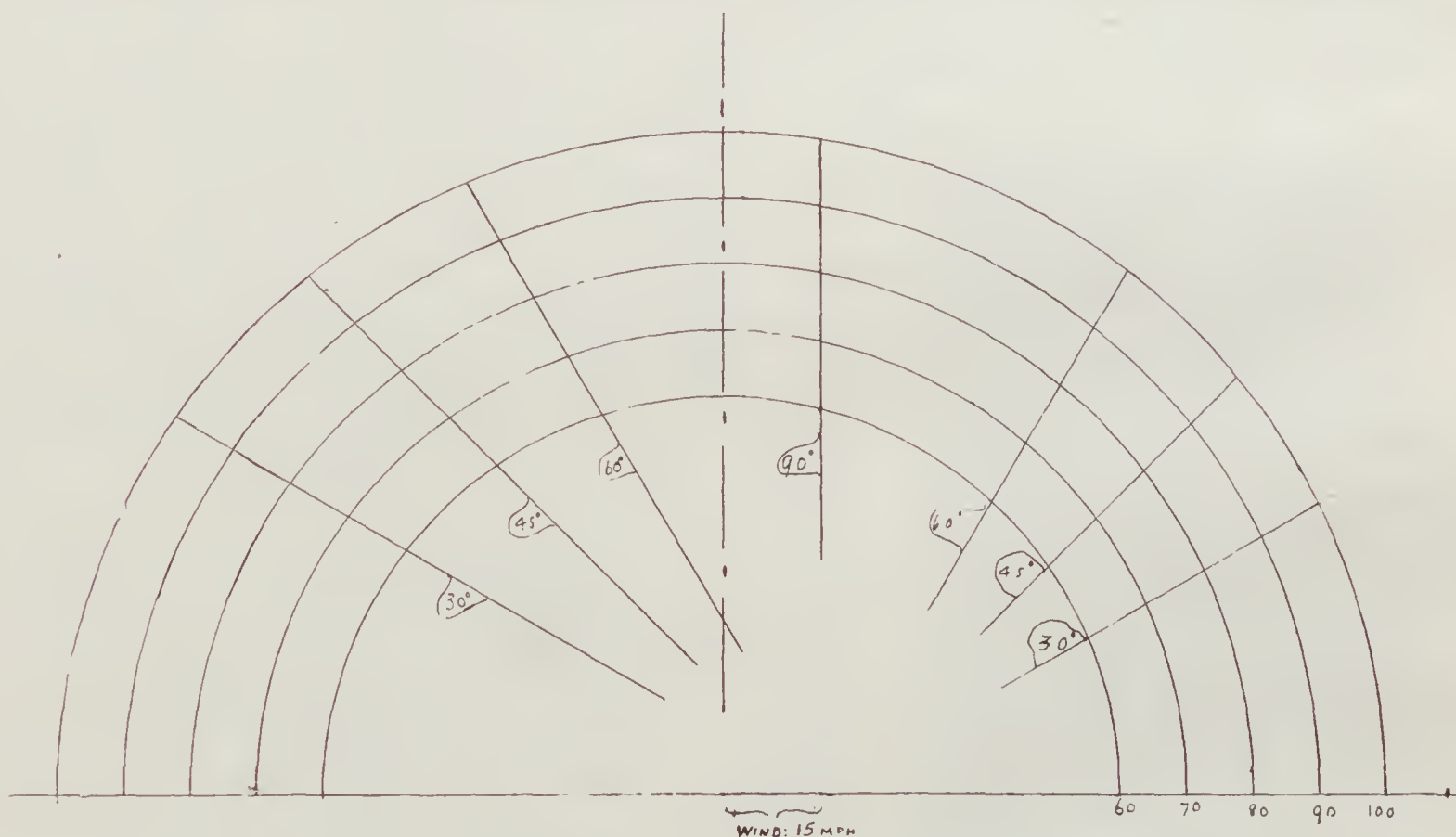
Though the subject therefore does not admit of stringent rules of computation, it is nevertheless possible to estimate with fair accuracy the time taken to accomplish under given conditions a cross-country flight either in a straight line or with a return to the starting point. The given conditions referred to are a knowledge of the average speed at which

time element; in fact, it is obvious that a longer period elapses during which the aeroplane is flying at its reduced speed than that during which it is flying at its increased speed. Hence, in the above case the 60 m.p.h. aeroplane would complete the journey, not in 10 minutes, but in $7\frac{1}{2}$ plus $3\frac{3}{4}$, that is $11\frac{1}{4}$ minutes, while the 80 m.p.h. machine would complete the journey, not in $7\frac{1}{2}$ minutes, but in 5 plus 3, equals 8 minutes.

In a calm, an aeroplane would obviously complete the whole course out and home in the time given by $t = \frac{2l}{V}$

where t represents the time in hours, l the distance between the two points, and V the speed of the aeroplane in miles per hour. Now let us suppose that a wind is blowing from the starting to the turning point, at a velocity of W miles per hour. The outward journey would take a time $\frac{l}{V-W}$

while the return journey would take $\frac{l}{V+W}$; the whole flight



the wind is blowing and of its direction relatively to the path of flight. Such a knowledge is pre-supposed in the method of arriving at the speed of air-travel outlined below. This knowledge may be of vital importance to the pilot, more particularly if he is flying over enemy country, running his fuel provision very close.

Let us first of all neglect the direction of the wind and consider it to be blowing parallel with the line of flight. Take a simple case. Suppose that a pilot is told to fly from X to Y on reconnaissance or for bombing a given point, which are five miles apart, and back again, and that a wind of 20 miles per hour is blowing from Y to X. At first sight it appears that what an aeroplane loses in speed against the wind it will gain when flying before the wind on the return journey; thus a 60 m.p.h. machine flying against the wind of 20 m.p.h. would have the effective speed of 40 m.p.h., while when flying with the wind its speed would rise to 80 m.p.h., still giving an *average* of 60 m.p.h. The conclusion, however, is incorrect, since it neglects the

out and home would therefore take $\frac{l}{V-W} + \frac{l}{V+W} = \frac{2lV}{V^2 - W^2}$. This time is naturally always greater than the time taken in a dead calm $\left(\frac{2l}{V}\right)$, hence the latter is increased, for a

given wind, by $2l \frac{W^2}{V(V^2 - W^2)}$. Take the simple concrete case already given, where $l=5$ miles, $V=80$ miles, and $W=20$ miles. The time taken for the double journey is $\frac{2 \times 5 \times 80}{6,400 - 400} = \frac{2}{15} = 8$ minutes, as against the $\frac{2 \times 5}{80} = \frac{1}{8} = 7\frac{1}{2}$ minutes taken in a calm.

Unfortunately for pilots the wind very rarely obliges by blowing in a direction exactly parallel to the path of flight; it usually blows across it at varying angles, and the time taken to traverse a certain distance will vary with the angle of the wind to the flight path. It would not be possible to evolve a simple formula suitable for easy and rapid calcula-

tion, giving the effect on the speed produced by winds of different velocities blowing at various angles. Intricate calculations are usually the last thing desired by a harassed pilot, either before or during flight.

Accordingly, A. W. Furbank, now a lieutenant in the Motor Machine Guns, and myself, some three years ago, evolved a simple graphical method of estimating with a minimum of trouble and calculation the speed of an aeroplane over the land—i.e., its ground-speed as opposed to its air-speed, the latter being recorded on the ordinary indicator—for any given velocity or direction of the wind. The method, it may be added, has been used in practice with excellent results, and has the merit of extreme simplicity. All that is required in order to enable one by its help to calculate the time required to travel a certain course, out and home if desired, is a rough knowledge of the speed of the wind at the height the journey is to be made, of the general angle of the wind to the flight path, and of the normal air-speed of the machine.

The method is simply shown in the accompanying diagram, which is drawn to any scale desired, though personal experience has shown that a scale of two millimetres to the mile is both handy and practicable. A is the centre point. Starting from here a series of concentric circles are drawn—according to the scale selected—indicating the normal air-speed of the machine in miles an hour in perfectly still air. On the base line is now marked off a point B, whose distance from the centre point A represents the estimated speed of the wind in miles an hour. From this second point B are drawn a number of straight lines cutting the circles successively at angles ranging every 15 deg. from 0 deg. to 180 deg., which represent the angle of the wind to the flight-path. The distance from B to the point where the particular circle representing the air-speed of the

machine in question is cut gives the ground-speed of the machine under the given conditions.

It should be understood that all angles to the *left* of the perpendicular (which corresponds to a true beam wind cutting the flight-path at right angles) refer to following winds, whereas those to the *right* of the perpendicular relate to head-winds. Incidentally it will be seen that, if there is any wind at all, the quickest time out and home is made when it is a true 90 deg. beam wind, and the slowest time when the wind is parallel to the flight-path.

It is, of course, obvious that a different diagram has to be drawn up for every wind-speed (though they could all be drawn on to a single diagram, which, however, would be somewhat complicated); but in practice it will be found that wind-speeds need only be calculated at 10 m.p.h. intervals, starting from 20 m.p.h. up to 60 m.p.h., so that only four diagrams are really required. Again, the machine's air-speed need only be estimated to within an approximation of 10 m.p.h., minor differences not materially affecting the result.

It may be objected that the variations in the velocity and direction of the wind with the altitude and the lapse of time may invalidate the result. Very true; but as a rule the general trend and speed of the wind are fairly constant, and enable a very fair estimate to be made of the time required to complete a given flight. And this is especially important in the case of long raids, such, for instance as that from Belfort to Friedrichshafen, representing a distance of 125 miles to be covered each way. In such a case petrol capacity has to be calculated beforehand to a nicety and a favourable wind awaited, so that the time required for the double journey may be estimated beforehand in order to save machines from landing in hostile territory owing to fuel shortage.

THE SELECTION OF AN AEROFOIL

Notation Employed.

Lift Coefficient	..	..	..	..	..	Ky
Drag Coefficient	..	..	..	..	..	Kx
Lift/Drag ratio	..	..	..	..	..	Ky/Kx
Ky corresponding to maximum Ky/Kx	..	..	..	..	..	C ₁
Kx corresponding to maximum Ky/Kx	..	..	..	..	..	D ₁
Maximum Ky/Kx	..	..	..	..	..	C ₁ /D ₁
Maximum Ky	..	..	..	..	..	C ₂
Kx corresponding to C ₂	..	..	..	..	..	D ₂
Ky/Kx corresponding to C ₂	..	..	..	..	..	C ₂ /D ₂
Maximum Velocity	..	..	..	..	..	V ₁
Minimum Velocity	..	..	..	..	..	V ₂
Economical Velocity	..	..	..	..	..	V _E
Body Resistance	..	..	..	..	..	RV ²
Mean Coefficient of Body Resistance	..	..	..	..	..	R

The following desirable attributes of an aeroplane are largely dependent upon the characteristics of the aerofoil.

- Wide Range of Speed.
- High Maximum Speed.
- High Economical Speed.
- Disinclination to "Stall."
- Quick Recovery from Dive.
- Slow Landing and Good Braking.
- High Rate of Ascent.

Variable Speed.

$$V_1 = V_2 \sqrt{C_2/C_1}$$

C₂/C₁ a maximum.

High Maximum Speed.

C₁/D₁ a maximum.

C₁ a maximum.

R a minimum.

High Economical Speed.

C₂/D₂ a minimum.

R a minimum.

Disinclination to "Stall."

High V_E { C₂/D₂ a minimum.
R a minimum.

C₂/D₂ a maximum.

Quick Recovery from Dive.

R a minimum.

C₂/C₁ a maximum.

C₁/D₁ a maximum.

Slow Landing and Good Braking.

C₂/C₁ a maximum.

C₂/D₂ a minimum.

R a maximum.

High Rate of Ascent.

C₂/C₁ a maximum.

C₂/D₂ a maximum.

R a minimum.

It will be noticed that many of the above factors are very conflicting, but, by compounding them all, the following formula is arrived at:

$$E = \frac{C_2^3 \cdot D_2}{C_1 \cdot D_1^2 \cdot R^4}$$

where E is an expression for the all-round efficiency of the aeroplane. Should it be desired to eliminate certain of the above qualities another formula may be evolved on similar lines. The most satisfactory aerofoil for an aeroplane possessing the characteristics outlined above is that which gives C₂³·D₂/C₁·D₁² a maximum value.

In conclusion the writer hopes he has demonstrated the significance of aerofoil characteristics and low head-resistance in relation to safety and economy, and that he has evolved a formula which will be of assistance to designers of aeroplanes of all types.

STEAM POWER PLANTS FOR AEROPLANES

THE possibilities of steam power plants, with their extreme of reliability, come to mind in this new age of aerial dreadnoughts and super-liners. At the October 19, 1915, meeting of the Aeronautical Society of America some

short notes were read on the subject of steam engines for aeroplanes. AERONAUTICS has been able to have these notes elaborated upon, with the addition of data on the boiler.

"UNA-FLOW" STEAM ENGINE

By WILLIAM CLINTON BROWN (Prof. Stumpf's Patent)

AS late as three years ago the consideration of steam as a motive power for aeroplanes met with little favour. Since that time, however, great progress has been made in the development of steam engines and boilers reducing the fuel consumption and permitting of lighter construction, so that I am convinced that if steam is impractical for aeroplane use at the present time it is not due to the weight of the engine and boiler, but to the limited radius of action on account of fuel and water to be carried. This statement should perhaps be modified to cover the large aeroplanes now being developed, as there does not seem to be a demand for anything better than the gasoline engine for powers below 100 horse power.

As the difficulty with gasoline increases rapidly above 100 h.p. it would seem that the steam engine is at least worthy of consideration for large powers.

The time at my disposal since I was asked to present this matter to your meeting has not been sufficient to give this question careful consideration, so it will only be possible to call your attention to the question and present some preliminary information for your consideration.

The result of Mr. Winslow's endeavour to improve the automobile boiler has given to the world a boiler remarkable for its light weight and compactness combined with safety at high steam pressures. It will be unnecessary to describe this boiler here as Mr. Cramer is preparing a paper on this subject which will be quite complete.

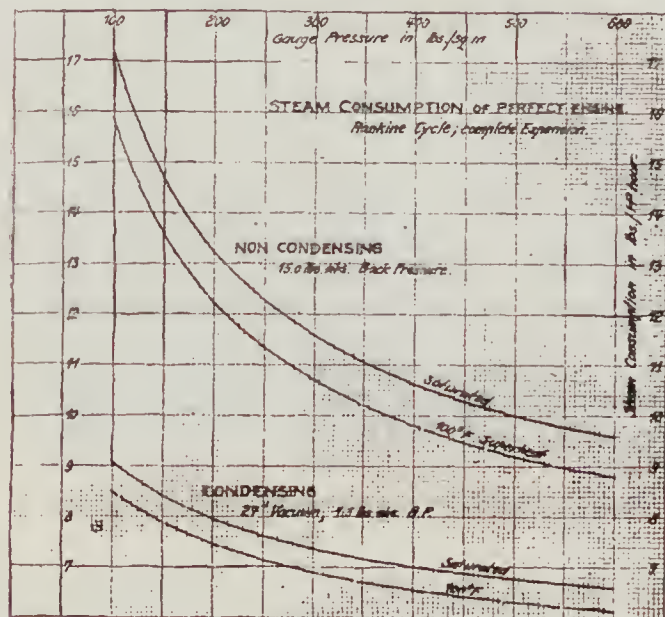


Fig. 70

The advantages of the use of high-pressure steam can be seen at a glance from Fig. 70, which are curves of the Rankine cycle showing economy of steam consumption per h.p. hour, for different steam pressures, assuming 100 per cent. efficiency. This advantage is more marked with non-condensing engines than with engines operating against a vacuum, and, as we will be limited to the use of non-condensing engines in aeroplane practice, it is desirable that the steam consumption be reduced to the minimum, and therefore high steam pressure must be carried.

In order to utilise the advantages of this high steam it is necessary to get practically the same efficiency of the Rankine cycle as is obtained by engines operating against low steam pressures. With the ordinary type of steam engine great difference of temperatures in the cylinders is followed by additional cylinder condensation, which offsets the benefits of the higher pressures. It has been found necessary to multiply cylinders, and in marine practice, where high steam is used, quadruple expansion engines are quite common. Fig. 54 shows the indicator cards from a quadruple engine, the black (white on this negative) representing the loss due to the multiplication of cylinders.

While Mr. Winslow was developing his boiler, Prof. Stumpf was perfecting the design of the una-flow engine, which practically eliminates cylinder condensation, therefore

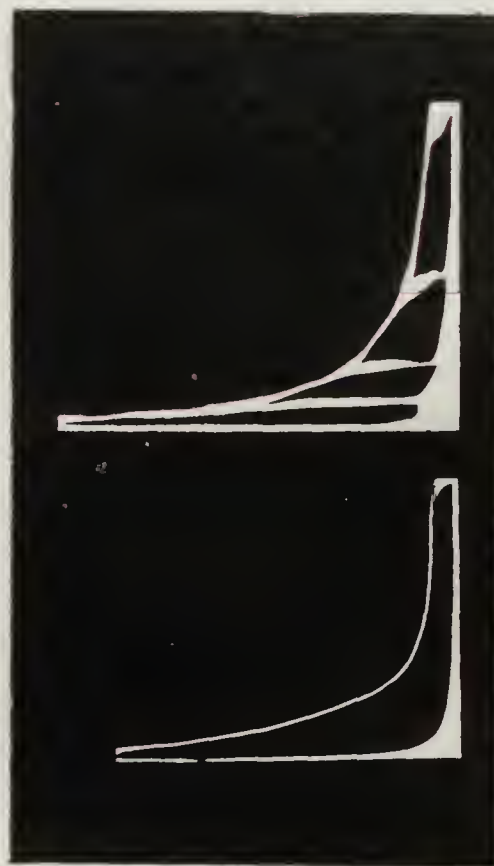


Fig. 54

is capable of utilising high-pressure steam in one cylinder without serious loss due to the wide range in temperature.

The lower figure shows an indicator card from the Stumpf una-flow engine, which clearly illustrates the advantage of this engine from an economical standpoint over the quadruple expansion shown in the top figure, provided cylinder condensation is eliminated.

How this cylinder condensation is eliminated is best illustrated by the temperature card taken by Prof. Naegel, at Dresden. (See Fig. 67.) It will be noticed that the exhaust steam remaining in the cylinder near the cylinder head is superheated by the jacket in the head, so that when raised by compression the temperature of steam in the cylinder, and consequently the walls of the cylinder, is

above that of the entering steam, so there can be no initial condensation.

During expansion the walls of the cylinder remain hotter than the expanding steam (see Fig. 64), which prevents any condensation during expansion.

The single-acting steam engine seems to lend itself better to the design of a una-flow engine for high temperatures

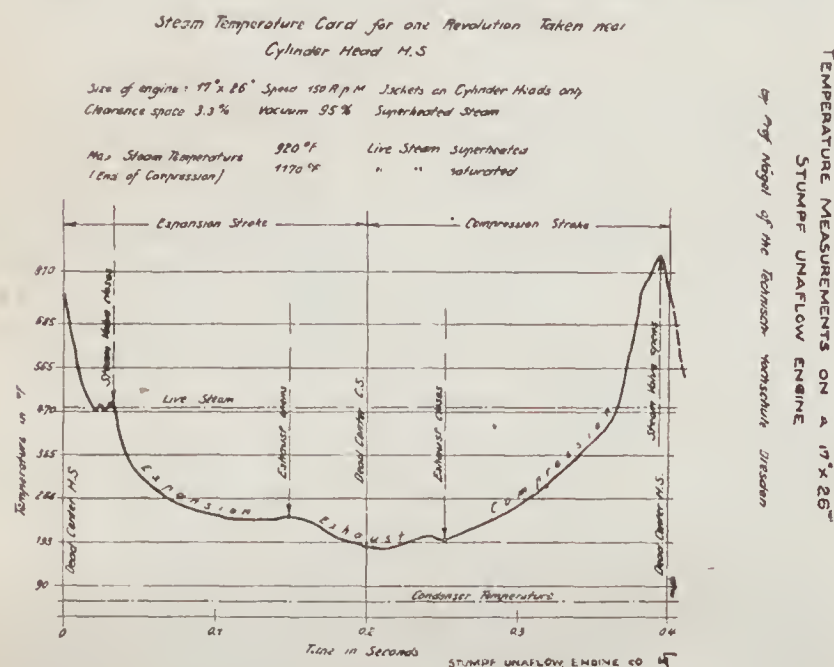


Fig. 67

than the double-acting, in two respects: namely, it eliminates stuffing boxes and simplifies the problem of expansion, as there is a gradual difference of temperature from the bottom to the top of the cylinder.

It also has the further advantage of simplifying the valve motion and obviating the reversal of strains in the working parts, which is important at high speeds.

Three different designs suggest themselves for aeroplane engines. The first, four cylinders in line, the least air

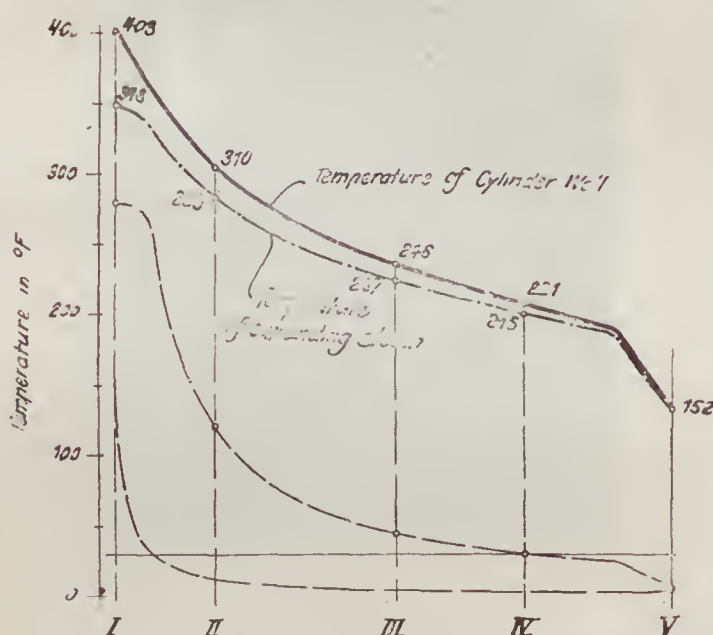


Fig. 64

resistance, but the greatest weight; the second, cylinders arranged as a V, reduces the weight somewhat and increases the air resistance; the third (Fig. 69), while it has the most air resistance, is so much lighter that it appears to be far superior to the others, and as it would probably be located either in front or at the rear of the boiler the extra air resistance would not be felt.

The arrangement of three cylinders at 120 deg. operating in one plane was selected with the idea of getting a good turning torque on one crank and a minimum of base. It will be seen that the valve motion is very simple, consisting

of one cam directly on the main shaft driving in turn the push rods operating the steam valves. There are no exhaust valves with the Stumpf una-flow engine, exhaust being obtained, as will be seen, by the piston uncovering the exhaust port at the bottom of the stroke.

If it is desired to have a variable cut-off, this is accomplished by making the back of the cam tapering and arranging a method of sliding the cam endwise of the shaft, as shown in the cut. If a fixed cut-off is satisfactory, this mechanism would not be necessary.

Believing that steam engines would only be considered for large powers, I have made the design for an engine of 200 h.p., revolutions 900 per minute, steam pressure 450 lb. to 500 lb.

The estimated weight of this engine is 400 lb. The condenser would probably weigh 100 lb.

This engine would probably require about $1\frac{1}{4}$ lb. of liquid fuel per horse-power hour and 14 lb. of water. No data is available as to the efficiency of the condenser with the great air velocity which could be counted on, but it seems safe to assume that at least 80 per cent. of the water would be reclaimable.

It is possible that a scheme for utilising petrol vapour in the boiler might be worked out, in which case part of the exhaust would be burned under the boiler and the rest

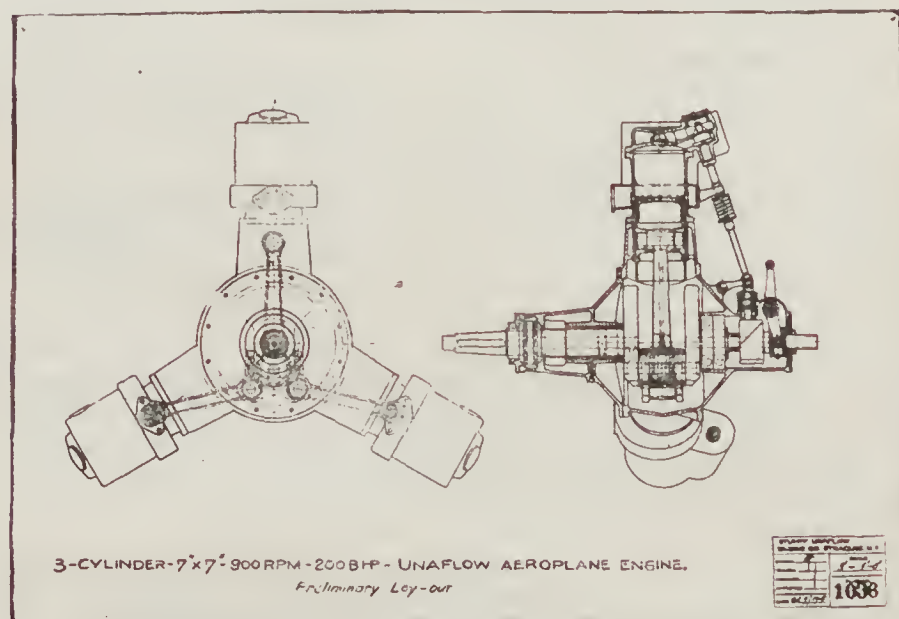


Fig. 69

reclaimed in the condenser. If this is found to be possible the only extra weight to be carried would be the fuel.

I think the reliability of steam propulsion will appeal to all; whether or not it is sufficiently attractive to warrant trial will have to be worked out with someone more familiar with the science of aviation than I am.

I desire to express my thanks to my associate, Mr. Wolfgang Turnwald, for his assistance in working out the details and preparing the drawings from which the slides were made.

(Another article on this subject will appear in our next issue)

TORPEDO CONTROLLED BY AIRCRAFT

Washington, January 13.

Wireless control from an aeroplane of a coast defence torpedo has been definitely developed. The Navy Department has asked Congress to appropriate nearly a million dollars to acquire the rights. Aeroplane control, navy officers explain, makes it possible for the operator to guide the radio-torpedo through the water from any height, air bubbles from the compressed air motor of the torpedo giving him a certain guide to steer it against a ship's hull.

By use of powerful glasses it has been possible heretofore to control the torpedo from the shore to a distance of nearly 10,000 yards, but the aeroplane device now will make the missile effective to the full range of its motor capacity.—*Reuter*.

[In the words of the Press Bureau, we see no objection to the publication of the above statement, but can accept no responsibility for its accuracy.—ED.]

PROGRESS OF AMERICAN AVIATION

By E. LARUE JONES, American Editor

NEW WRIGHT DUAL CONTROL

A NEW Wright dual control has been adopted for the school work at Augusta, Ga., and on the Navy's flying boat which has been delivered lately. The Navy has for some months been experimenting with a view to standardizing its controls.

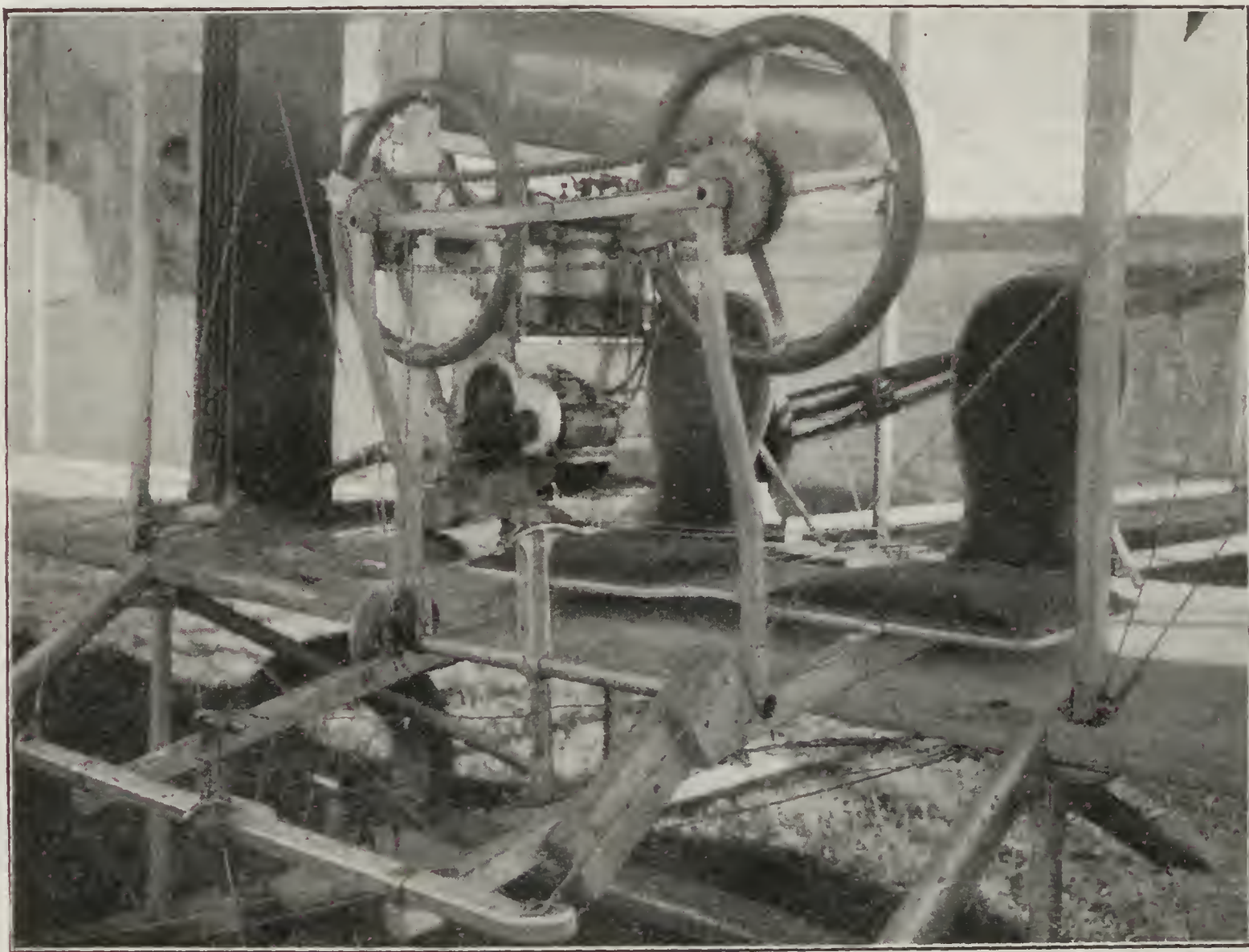
Two hand wheels are mounted in the same plane side by side, and connected by a chain running over small sprockets on the forward side. The right-hand wheel assembly has two single sheave pulleys, one of which is permanently connected to the sprocket and shaft. Wires over this pulley and others at the leading edge of the plane run back in the usual manner, and thence outward for wing warping. Another wire over the loose pulley on the right-hand wheel operates the vertical rudders through movement of the grips noticed on the circumference of each of the steering

now warp, but is hinged at about two-thirds back of leading edge.

The elevator is now made rectangular. The elevator controls are doubled. The standard Wright 40-h.p. engine, Mea magneto, is used. The fuel is forced by pump to a mixing tube, where it is sucked into the engine. The Wright is the only high-speed motor using this type of fuel feed.

In the picture is also noticed the spark advance wire, fastened to a ratchet gear and foot lever. There is, of course, no carburettor, so-called, or throttle lever. All control is by the Mea magneto, which gives such a wide range of spark timing. Larger wheels are used in the running gear than heretofore, and there are now but two on a solid axle.

In a later note we will publish a description of the Delco



THE WRIGHT DUAL CONTROL

wheels. By holding the wheel and grip at the same time warping and rudder turning are simultaneous. In other words, the warping and rudder movements are independent or work in conjunction simultaneously, as desired.

The elevator is operated by fore and aft rocking of the hand wheels and the columns on which they are mounted, about the axis of the horizontal shaft mounted on the extensions of the seat beams, which continue to form foot-rests. Wires run from the sectors fastened to the horizontal shaft to the elevator, as is common in all Wright machines.

The whole steering system is prevented from falling forward when not in use by the block fastened to the foot-rest spars, which was the school's first-aid method of handling this difficulty.

A change has been made in the elevator, which does not

system of starting, which is to be standard on Wright machines. Machines not arranged with starters may be easily so fitted by using a Delco starting motor and storage battery without going to the expense of equipping with generator and charging mechanism. Of course, the battery will have to be charged at some local station after being removed from the machine.

U.S. FLYING BOAT OWNERS TO PASS FEDERAL EXAMINATION

FLYING boats are already classified as motor boats under the Federal law, and several operators who have used them for carrying passengers for hire have had to obtain license and equip the machine with proper life pre-

servers, etc. No examination is necessary to obtain license up to the present.

However, if the Bill now before Congress is passed, every applicant for a license may only obtain same by passing a written examination before the Board of Local Inspectors and proving trustworthy character and merit and requisite knowledge and skill.

Motor boats (including flying boats) are under national supervision for the reason that all navigable waterways connected with the coast-line are under Federal control. There exist, however, many State laws, most of which are, quite properly, based upon existing national laws. These State laws, however, would only apply to inland lakes.

The Bill of the Pennsylvania Aero Club to provide for Federal registration of all aircraft and the Federal licensing of operators seems to have become lost in the "shuffle." Some of these days, when no one is looking, some rude diplomat will put through his State Legislature a registration and license law, and other States following will provide us with as fine a mixture of State aeroplane laws as we now have for automobiles, to the perpetual disgust of drivers and owners.

If the few aero clubs in America who can be found by the postman would spend more time on practical upbuilding and less on Press-agenting we might really get ahead a bit.

MAGNETO PISTONS

IN various motor races held during the past few months in the United States one of the features of most of the successful cars has been their use of "magnalite" pistons, made from magnalium metal. Magnalite pistons have a thermal conductivity of 14 to 1 as compared with iron castings, and through lightening of the reciprocating parts



LEVETT MAGNALITE PISTONS

greatly reduce vibrations. They have a tensile strength which is superior to the conventional type of pistons generally used.

Where a reduction of weight is desirable in adding to the number of cylinders formerly employed, magnalite pistons are essential and already have been adopted by some of the best known automobile and engine manufacturers. Magnalite pistons weigh approximately one-third as much as iron

pistons, and owing to their greater bulk—as relative to weight—and economy in machining can be delivered in quantities at prices that are surprisingly little in excess of those paid for high-grade iron castings.

The X-ray drawing illustrates the new system of re-



X RAY DIAGRAM

inforcing ribs for magnalite pistons adopted by the manufacturers, the Walker M. Levett Co., of New York. A careful study of the drawing will show that the carrying strength of these pistons has been so distributed that every stress under very high speeds is provided for, while at the same time a feather-weight construction is permitted, which assures a minimum weight for the piston with a consequent lessening of weight at the vital point of the reciprocating parts.

It may be added that of the first eight cars in the Astor Cup race, on October 9, seven were equipped with magnalite pistons, as also was the motor-boat *Disturber IV.*, owned by Commodore Pugh, which recently established the record of maintaining continuously a speed in excess of 60 miles an hour.

WRIGHT CO. SUIT

The suit of the Wright Co. against the Curtiss Aeroplane Co., lately reorganised, set for hearing January 24, has been postponed again, owing to the sickness of one of the attorneys involved. An accounting has been asked for by reason of the adjudication of the Wright patent in the former litigation against the Herring-Curtiss Co. and Glenn H. Curtiss, and the new suit brings into question other claims than were adjudicated before and alleges continued infringement by the newer company of claims adjudicated in the decision obtained.

Paragon propellers on the Navy's Curtiss hydro-aeroplanes now hold the hydro-aeroplane altitude record in America, officially logged as 11,056 ft., Pensacola, Fla., November 30, Lieut. R. S. Sausley, U.S.N., and 11,975 ft., Pensacola, Fla., December 3, Lieut. R. S. Sausley, U.S.N.

U.S. EXPORTS

For the week ending January 8 exports of aeroplanes and parts totalled \$166,314 from the port of New York.

U.S. EXPORTS AND IMPORTS

DOMESTIC EXPORTS						
			AEROPLANES		PARTS	TOTALS
November, 1915	...	...	4	\$13,770	\$284,936	\$298,706
11 mos. ending November, 1915	385		\$2,804,467	\$1,125,795		\$3,930,262

RANDOM REMARKS

XXXVI.—THE BOOK OF THE CHRONICLES. By ARTHUR LAWRENCE

THE time of year is now upon us when extensive white spaces appear in our diaries. They may be scarred here and there by the scratch of a pen, spasms of conscience, intermittent heart-beats of forlorn resolutions. One of these Biblical-looking affairs now lies on my table. It is bound in black leather, and the entering it up liked me well until about the tenth day. Thereafter it becomes but a list of appointments—scarcely that. The black of the binding is a reproach. It has gone into mourning over my infidelity, and I have a mind to retort by dropping it into the flames. In small letters of gold it is described as the "Paragon" diary. There is a mute insolence in the word. - Would that the dead, dumb thing could speak! I would engage it in wordy warfare at once. Anything would be better than its hang-dog appeal to be smoothed and fondled and scratched.

I have glanced at some of the entries. If I wished to assure myself of the futility of my existence I will admit that the cost of that diary was money well spent. If I ever exalt my horn in the lust of life and the pride of my heart, the study of one of my diaries is a sufficient corrective. I used to try walking around graveyards and reading the epitaphs, more particularly on those few occasions when I had a really tangible cheque

ing analysis of my thoughts and deeds of the day, but as this involved hiring a place of security for the diary at some Safe Deposit I gave it up.

My deserted diary has a page for what the editor thereof entitles "Personal Memoranda." It is the first time that I have responded to these interrogatories. I have been through many well-earned vicissitudes, but, despite all temptations, I do not think there has been any day when I have appeared in polite society uncollared. The habit of wearing a muffler in lieu of the linen has not yet obtained any real grip on my fancy. Yet in absent-mindedly addressing some worthy merchant with a request for a humble half-dozen of my special wear, the "What size, sir?" has sometimes thrown me into confusion. I have had to work away from the neckband of the shirt, which, I



in my pocket and wished to cool off from an inclination to crown myself with laurel and wrestle with rosy lips and red wine. Churchwarden or Sidesman, or Highly Respected—the paths of glory lead but to the grave! You also wondered what the spirits of the deceased thought of the deep cuttings of ungrammatical rot. After which—well, there is the danger of a violent re-action and of conduct which involves a long jump towards a grave of your own. So often the best-meant efforts have the most unexpected and unseemly results. Years ago I used to write up a search-



believe, is "fifteen," which gets one's collar to 15½. By the time you have worked out this bit of simple arithmetic the gentleman assists with some bit of guess-work, and this makes matters worse. Consequently it seemed good to me to fortify myself with a permanent record of these little matters. Yet I am pained to observe that there are more blanks than entries. It begins with "Watch No." Well, I believe there is a number inside an Ingersoll watch, but in order to get at it you have to prize off the back of it with a screw-driver or a tin-opener, and in order to re-fasten the back you have to smite it with a tack-hammer, by which time you have broken the glass. So it all seems hardly worth while. If my watch goes astray the finder may keep it.

There is another entry for one's "Bicycle No." I used to be rather partial to cycling. The last one I bought was a special effort. Never have I seen anything so glistening with silver-plate or its substitute. There seemed to be no safe place for it in the house, so I left it with a local bike-protector at so much a month. The bill ran up quite a bit, and the short of it is that I made a present of my brand-new cycle to that sorry knave. The "Bank and Pass Book No." I pass over. Fifteen years did I pass fabulous sums

through my bank, and then came the day when the word "moribund" was exploited against me in a most unpleasant manner. I reckoned up how much the bank had profited by making use of my money and making marks in a big book. Then I became rude in my turn. 'Twere best to pass over these painful scenes. Let us come to "Size in Hats." That was easy. I wrote down $7\frac{1}{4}$. With ready pen I replied to the demand for size in boots as Number Nines. Then follows weight, 11.3, and height, 6 ft., without mentioning that I might miss it if I stood in my socks—a thing I do not like doing. There are tacks.

Alas! for those moments of enthusiasm which brought me on almost intimate terms with a diary. There are other times, which have now arrived, when this new-found friend should be consigned to the flames. If I do that I shall forget—at the critical moment—whether my rivals are of my own fighting weight, and shall come out of a shop with collars that no properly proportioned fellow can wear. Yet all these embarrassments will be compensated for by the fact that when I do make my highly-Bowdlerised last dying speech and confession the hangman will not be able to bring up my old diaries against me.

THE ZEPPELIN RAID ON PARIS

THE following account of the attack by French aviators—whose names have been suppressed by the French censor for some inscrutable reason, though their photographs were allowed to be published—upon the Zeppelin which raided an outlying district of Paris during the night of January 29, has been published in the French Press:—

The alarm was telephoned to Bourget from the advanced post at 9.21 that a Zeppelin was reported over Férétille Milon travelling towards Paris. One by one the thirty defence aeroplanes of Paris rose into the misty night, which rendered the work of the searchlights completely ineffective. Five of the aeroplanes, which were specially entrusted with the patrol of a small sector of Paris over which the Zeppelin ventured, saw the raider, and in spite of very unfavourable conditions pursued it. Three of these machines were chaser-planes, two others were gun-planes. Two chaser-planes and one gun-plane engaged the Zeppelin in a fight which can be divided into three acts. The first aeroplane to attack was patrolling at the highest level. It vainly pursued and, after having expended all its incendiary cartridges, had to abandon the chase. Meanwhile, one of the two gun-planes, which had been rising steadily, took the place of the chaser-plane, and opened a heavy fire upon the fleeing Zeppelin. Its gunner believes that he registered one hit, but in any case the speed of the Zeppelin in no way slackened, and on its flight to the west it was again attacked by a gun-plane, which managed to get within a range varying from 50 to 100 yards, and, circling over and under it in order to avoid the machine-gun fire of the Zeppelin gunner, vainly endeavoured to bring down the raider. At one time, while this plane was above the Zeppelin, its pilot was able to follow the fight taking place between the Zeppelin and another plane below him. Finally, the gun-plane was left alone, and for 53 minutes he hung on to the heels of the Zeppelin, firing whenever he got his chance. Then motor trouble forced him to relinquish the pursuit. The Zeppelin, which was thus pursued, was over the city only for three minutes, and in that time killed twenty-nine people and wounded about as many. The raid accomplished no useful military purpose, unless Germany can see a victory in the fact that the Zeppelin has destroyed the Petit-Jean family, the head of which had just returned on leave from the front. The whole family was united for the first time since the war began, when a bomb struck the house, killing a girl fifteen years of age, one eighteen months old, and two boys of ten and eight respectively, a man of sixty-six, and a woman.

It is a noteworthy fact that every one of the aeroplanes engaged returned safely to the aerodrome, only two machines landing heavily and one capsizing, though no one was injured. It is understood that several of the aviators have been recommended for decorations.

These two raids will without question give vigour to the attack upon M. Besnard, the Under-Secretary for Aviation,

who, for political reasons, is distasteful to many politicians. But a few of the Paris papers take the view that really the necessary thing is to preserve a sense of proportion. The air services in France have been passing through a period of reorganisation. For several weeks past there has been a growing agitation against M. Besnard. The raids, probably, will bring the matter up again, and the effect will undoubtedly be to strengthen the demand for energetic reprisals.

In the evening of Monday, February 2, a listening post near Compiègne heard the engines of an approaching dirigible, which, however, turned tail as soon as it was picked out by the searchlights.

The Bombs

The bombs dropped during the second raid, all of which fell in fields or waste ground, and caused no damage to life or property, numbered forty in all, and were partly explosive, partly incendiary. Several of these bombs failed to explode, and are now being examined by the authorities. These are ordinary steel spheres without handle; two of them weigh 136 lb., and measure $12\frac{1}{2}$ in. in diameter; the shell is $\frac{5}{16}$ ths of an inch thick, and contains 46 lbs. of trinitrotoluene. The third bomb weighs 224 lb. and measures 20 in. in diameter.

On February 1 the subject of the air defences of Paris was raised in the French Chamber, but no discussion took place, General Gallieni, Minister of War, promising to give full details to the War Committee on February 2.

The *Matin* has renewed its offer to award a prize of £1,000 to the first aviator to bring down a Zeppelin within the entrenched camp of Paris and a sum of £400 to the first gunner achieving the same feat.

THE MANN MONOPLANE

SIR,—With reference to the note under the heading of "Replies to Correspondents" on page 85 of AERONAUTICS of the 2nd inst., the undermentioned particulars of the Mann monoplane are forwarded for the information of G. W. F. G. (Scarborough).

The fuselage is made from two pieces of silver spruce $\frac{1}{4}$ in. square and 34 ins. long, and formed into a triangular shape tapering from 17 ins. at the rear to nil at the nose. The cross brace at the rear is $\frac{1}{4} \times \frac{1}{8}$ in., and another cross brace is fixed at 12 ins. from the nose. The main plane is of elliptical form with a span of 17 ins. an arch of 4 ins., and made from 18-gauge piano wire. The monoplane has two ribs with a camber of $\frac{1}{2}$ in. The front plane is 7 ins. span \times $12\frac{1}{2}$ in. wide and $\frac{1}{16}$ in. thick. The forward edge of the plane is straight, with the rear edge tapering from $1\frac{3}{4}$ in. to the square ends which are 1 in. wide. The dihedral angle is 30 degrees on the entering edge and 5 degrees on the rear. The front plane is 2 ins. from the nose of the machine and the main plane 12 ins. from the rear. The propellers are 8 ins. in diameter, with a pitch of 24 ins., and are driven by six strands of $\frac{1}{4}$ in. strip rubber. The total weight of the machine is 4 ozs.

C. J. COULSON.

QUEENSLAND'S FIRST AEROPLANE

ON November 22, 1915, at Hemmant, near Brisbane, in the State of Queensland, the official christening took place of the first aeroplane built in Queensland. The machine, which is of Caudron type with fuselage, has been built by voluntary effort by members of the Queensland Volunteer Flying Civilians, a corps formed and controlled by Mr. Thomas Macleod, a Brisbane barrister, author of

nor does any member receive any pay. The funds required for building the machine and its hangar were raised by Mr. Macleod by appeals through the leading Brisbane daily paper, the *Courier*, after which the machine has been named. The constructional work was done in Brisbane, at St. Paul's Presbyterian Church Hall, which was lent for the purpose. The dimensions of the machine are: Span of



QUEENSLAND'S FIRST AEROPLANE. MR. T. MACLEOD AT HEMMANT.

several legal publications. The corps, though not run by the Defence Department, was formed with the sanction of the Minister of Defence, and its object is to train civilians as aviators for defence purposes and for active service. No members were accepted unless they signed on to go on active service if required. No member is to pay for tuition,

top plane, 33 ft. 9 in.; of bottom plane, 21 ft. 9 in.; chord, 4 ft. 6 in.; length over all, 23 ft.; tail plane, 7 ft. 5 in. on leading edge and 9 ft. on trailing edge, with chord of 1 ft. 7 in., beyond which are two flaps 16½ in. wide. The main spars, struts, and skids are of best American hickory. The ribs and formers are of Queensland maple. The fabric is

Irish linen doped with celluloid dissolved in acetone. The propeller was made by Jas. Moore and Sons Proprietary, Ltd., Melbourne, and the tyres by the Queensland Vulcanising Co., Brisbane. The engine is a 35 h.p. inverted Y-type Anzani. Men are already being trained in grass-rolling with good results. The men who did the constructional work under the supervision of Mr. Macleod are Herbert George Smith, William Fraser, A. J. Thynne, jun., Ernest Handley, V. G. Sardoni, George M. Cherry, Valde-

mar Rendle, H. H. Turk, R. H. Knyvett, R. de Mattos, Chas. L. Clark, Harold Dent, C. V. J. Heyelmann, and Frank Clarke. A. W. Jones, a motor salesman, who had previously taught himself to fly with an imported Caudron, had charge of the constructional work for some time, but ceased to be a member before the machine was completed. Mr. Macleod and a number of the men have volunteered to come to England for training and active service with the aviation branch of the Army.

MODEL AEROPLANES—XXV.

By F. J. CAMM

TURNING now to the question of covering, we can consider the material best suited to this purpose, and the methods of attaching and proofing the fabric. Excluding the commercial fabric specially made for model aeroplanes, there are only three materials that can be purchased from the drapers worthy of notice—Jap silk, Nainsook, and Irish linen. The former is by far the most suitable, weighing only $1\frac{3}{4}$ oz. to the square yard, the two latter nearly double this. Again, Nainsook and Irish linen absorb twice the quantity of dope required for Jap silk, which makes their ultimate weight prohibitive for small models. Apart from this, the silk can be obtained in a greater variety of shades, and individual tastes can thus be better suited.

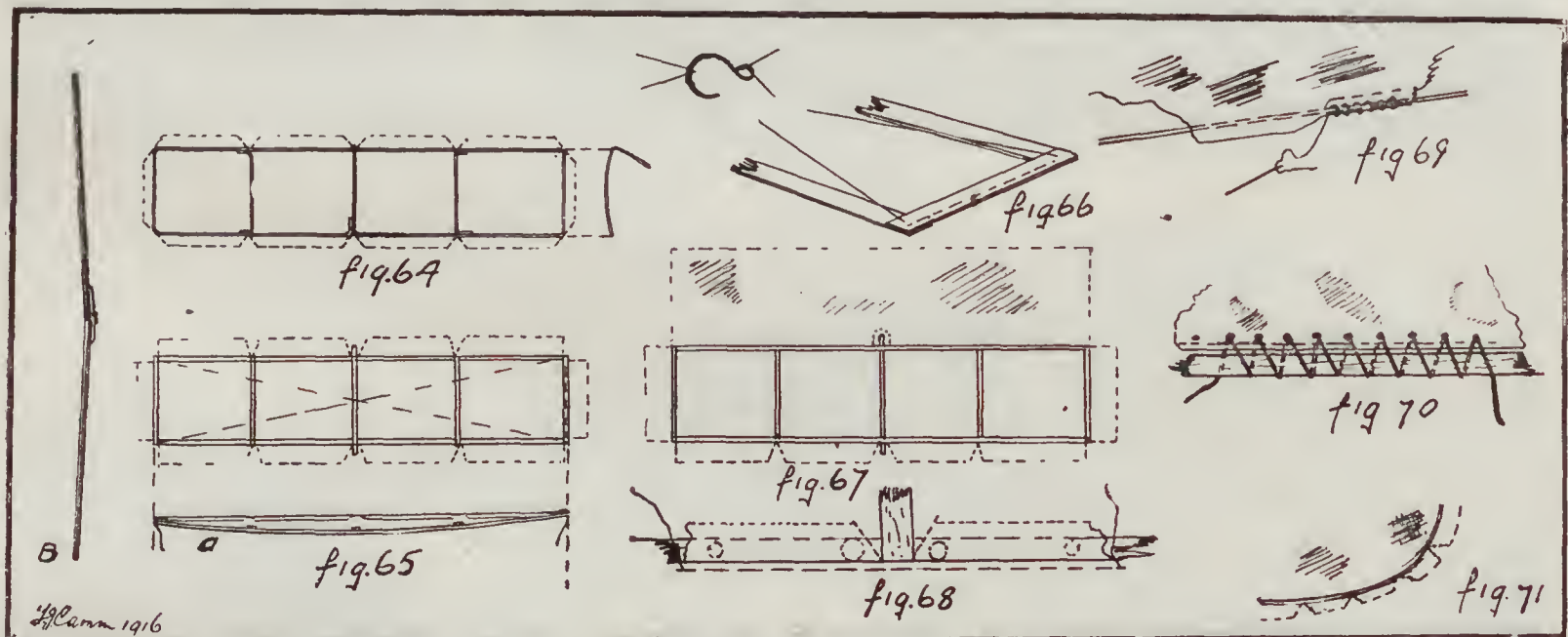
However, it is not so much upon the actual material that we need dwell as upon the *doping* and *covering* of the plane; a badly covered or proofed wing can interfere materially with the flying of the model. Yellow silk should be used

ing the fabric taut while pressing it down to the wood.

It is preferable to bend the wing spars to the correct dihedral (see B), as, by imparting a dihedral afterwards by means of a cross-bracing, the fabric is thus slackened, so that the fabric when the machine is in flight, instead of remaining true to the form of the plane, balloons out.

It will be found advantageous in cross-bracing the wing to continue the thread down through the end rib and thence up through the second hole. It will then be found possible to warp the wing when necessary. The bracing should be affixed in two pieces, so that the plane can be left flat when not in use. A hook of the shape shown in the upper sketch of Fig. 66 will be required to connect up the bracing threads.

Fig. 67 illustrates the method of double surfacing a wing. As before, the fabric is stretched end to end first, and allowed to set. The V seams are then glued home, and the fabric



for preference, as this colour is least affected by the action of the dope.

Now, as to the actual covering. Fig. 64 shows an ordinary wire elevator, the dotted lines indicating the shape to which the fabric is cut. The correct procedure for covering (provided the fabric is to be secured with glue) is to fasten one end of the wire frame to the table, with the fabric between, by means of two drawing-pins, one at each corner. Now stretch the fabric and similarly secure the other end of the frame over it. V-pieces should be cut out of the edges where the lap would encounter the ribs. Glue the lap, using a clean tube-glue, allow to get tacky, and then press it over with a linen wad, at the same time effacing any wrinkles by suitably pulling the seam.

The method of covering a wooden wing (Fig. 65) is to cut the fabric to the shape shown by the dotted lines; now glue the end ribs of the plane underneath. Press the end laps over the ends, pulling the fabric sufficiently taut to give the wing a curved dihedral as at A. When the ends are dry proceed to glue the laps underneath the spars, work-

pulled over the top surface being finally finished as in Fig. 68. It would be necessary in double surfacing to give the fabric a coat of dope first to prevent the varnish percolating through the pores of the fabric and coagulating inside the wing.

With wire wings it is better to sew the fabric to the frame. Just pin the fabric round the frame, stretching it sufficiently to avoid distortion of the wing, and then sew round with an over-and-over stitch, as in Fig. 69. The overlap should be trimmed off to within $\frac{1}{8}$ th of an inch of the stitching and then lightly glued round to prevent the edges fraying.

Another method is to cut the fabric a $\frac{1}{8}$ th smaller than the wing, machining a hem along to form a substantial bearing for the $\frac{1}{8}$ th eyelets; through these pass the silk lacing cords which fasten the fabric to the wing spars in the manner shown in Fig. 70. Although this is hardly a neat method of fabric attachment, this latter is easily detachable to allow of repairs to the wing framework; moreover, it permits of the fabric being tautened when this has become saggy.

When glueing the fabric to wooden spars, drawing-pins may be partially pressed into these latter to hold the fabric until the glue is set. Fig. 71 needs no explanation.

A good proofing can be made by diluting varnish with linseed oil in the ratio of 3 : 1. It does not go hard, neither is it hygroscopic, and two thin coats should be sufficient to make the fabric impervious both to air and water.

Varnish reduced in "body" with turps can also be recommended. In no instance should petrol be used to dilute varnish, the result of so doing being a varnish that, when dry, cracks upon the slightest touch.

(To be continued)

THE "SPOTTERS"

The "Spotters."—We quote below extracts from an article by Mr. H. Warner Allen, which recently appeared in the *Observer* under the above heading :—

When it is a question of directing the fire on points behind the enemy's first line, the services rendered by the aeroplane are invaluable. A week ago, when I was visiting the Artois front, aerial reconnaissances had been interrupted by a series of rainy and misty days; then there came a clear, sunny autumn day, and the aviators on either side eagerly seized this opportunity of renewed activity.

Two, four, six, and even more aeroplanes were to be seen in the air at the same time, and the anti-aircraft guns were hard at work until the whole sky was dappled over with the little white smoke cloud of bursting shrapnel. Two *Bosche* aeroplanes came gliding over our lines, and were so warmly received that they soon swept round and returned to their own lines.

It has become quite an exceptional thing for the Germans to risk themselves above the French positions. At the beginning of the war they had a considerable number of very expert pilots, and their whole aviation service was far more efficient than anybody had suspected. Now, however, they have lost many of their best aviators and those who remain they keep in reserve to be used only on very important occasions.

While in France and England there is not the slightest difficulty in filling up the gaps in the Flying Corps and in keeping up a constant supply of skilled aviators, the Germans appear to find this task far more difficult, and the French flying men are agreed that the new German pilots, who alone were allowed to take the risk of flying above the French lines on ordinary occasions, and that only rarely, cannot compare with the men who piloted the enemy's aeroplanes at the beginning of the war.

Apart from the aeroplane, the Germans attached the greatest importance to the captive balloon for directing the fire of their artillery and at the beginning of the war they were plentifully supplied with what the French call "*saucisses*," from its sausage-like shape. The *Drachen* balloon, as the Germans call it, has completely replaced the captive spherical.

With their traditional faculty for adapting themselves to circumstances the French set to work at once to repair their inferiority in this matter. They constructed "*saucisses*" so that they, too, might be able to keep up on the enemy's lines that continuous observation of which the aeroplane is incapable. At the beginning of the year in various visits to the front I saw not more than one French "*saucisse*" to five or six German *Drachen*. Recently in Artois and Champagne I counted as many as nine often five or six of them for a single German *Drachen*. Often French "*saucisses*" visible from a single point, and there were the observer's day, which has to be spent with eyes and glasses continuously focussed and attention unceasingly concentrated on the enemy's positions and the roads which lead to them, lasts of necessity from an hour or two before sunrise to an hour or two after sunset. When the "*saucisse*" is resting it is vulnerable enough, and it is all important that the enemy should not discover where its resting-place is.

"The worst experience I have had," an officer told me, "was when, after the balloon had been run up, I discovered that the telephone wire was broken and I had to spend a whole mortal day in the air with no means of communication with the earth. At last, after hours of boredom, I went to sleep, and they found me curled up fast asleep on the bottom of the car when they hauled the balloon down."

An excellent illustration of the work done by the sausage balloon is given in an article by Mr. George Prado, recently published in the *Journal*.

The Germans had brought up a big 15-inch naval gun to a certain point on the front and, in strict accordance with their habits, they tried one day to bombard an open town right behind the lines, where the utmost they could hope to do was to kill a few civilians and damage a certain amount of private property.

The first of these big shells was heard roaring overhead by an

observer in a captive balloon, who at once set to work to watch the enemy's lines for anything unusual that might give a clue to the position of the noisy newcomers. At first he noticed nothing suspicious; then suddenly it struck him that there was something unfamiliar about a clump of small fir-trees on the crest of a distant hill. He studied them through his glasses, but could observe nothing remarkable about them except that they were growing very close together and seemed to have suffered less than any of the woods near, which had been torn to pieces by shell-fire.

If they had suddenly grown up in the night, it could only be that the Boches had planted them there, and they could only have planted them there to conceal something. What was more likely than that the trees marked the emplacement of their new gun? A word down the telephone, and six-inch shells began to fall into that clump of trees with unfailing accuracy and regularity. The big German gun spoke once again, and then it was silent. It has been silent ever since.

The unquestionable superiority of the Allied aviators has made the Germans very dependant on their captive balloons for long-range firing, and the French are now making great efforts to blind the enemy's big guns.

Several methods have been devised to attack the "*saucisse*", but the most successful is the "*avion-canon*," the aeroplane with a small gun firing an incendiary percussion shell. If a single one of these shells gets home the whole balloon bursts into flames.

PROGRESS AT THE FLYING SCHOOLS

The Grahame-White School—Report of the progress of pupils at school for the week ended February 4, 1916 :—Civilian School : Straights with instructor—Baragar, Barret, Box, Hathaway, Hillaby, Holman, Kryn, Sandys, Scheidt, Spencer Walk, and Williams. Circuits and eights with instructor—Hallet. Brevets during the week—McClaghrie.

The Hall School—With C. M. Hill and H. F. Stevens : Redford, Ridley, Sepulchre, Ormerod, Evans, Smith, Dresser, Nicolle, Cook. With J. Drew : Millburn, Woolley, Lieut. Cooke, Neal, Thom, Chapman, Collins. With A. Chave : Rayne, F. Smith, Rochford, Mahaney, Warsick, Rand, and Hucklesby. The following pupils should shortly apply for certificates : Redford, Ridley, Nicolle, Evans, Sepulchre. Machines in use, Hall Government type tractors.

The London and Provincial School—Instructors : W. T. Warren, M. G. Smiles, H. Sykes, C. M. Jacques, and W. T. Warren, jun. Pupils who have had practice during the week : Palchthorpe, Goussencourt, Vilain XIII., Houba, Brown, Scott, Aldous, Clement, Creaghan, Ledure, Foley, Egelstaff, Dawson, and Pulford. Machines in use, four tractor biplanes.

The Midland Flying School—The Midland Flying School, Birmingham, organised by Mr. S. Summerfield, suffered severely through the gale that swept across the Midlands during the latter part of last year. The aerodrome, being situated on one of the highest points around Birmingham and 500 ft. above sea level, caused the hangars to receive the full force of the wind, with the inevitable result that one large new hangar was laid flat, and the one that housed the lamentable "*aerial wheel*" was severely damaged. Most of the machines were more or less wrecked, and those that were under construction did not escape some sort of damage. A 50 h.p. Gnome Bleriot two-seater, which Mr. S. Summerfield tested before his departure from Birmingham, was the only machine unscratched. In testing this machine he showed considerable skill in handling a Bleriot, and there is no doubt before long he will make a good name for himself. We hear that he may turn up as an instructor at the Bournemouth Flying School.

AIRCRAFT IN ACTION

OFFICIAL INFORMATION

ENGLAND

February 1—Zeppelin's Raid on England—Issued by the Press Bureau: "A Zeppelin raid by six or seven airships took place last night (January 31) over the eastern and north-eastern and Midland counties. A number of bombs were dropped, but up to the present no considerable damage has been reported. A further statement will be issued as soon as practicable."

"6 p.m.

"The air raid of last night (January 31) was attempted on an extensive scale, but it appears that the raiders were hampered by the thick mist. After crossing the coast the Zeppelins steered various courses and dropped bombs at several towns, and in rural districts, in Derbyshire, Leicestershire, Lincolnshire, and Staffordshire. Some damage to property was caused. No accurate reports were received until a very late hour. The casualties notified up to the time of issuing this statement amount to 54 persons killed and 67 injured."

"7.55 p.m.

"Further reports of last night's raid (January 31) show that the evening's air attacks covered a larger area than on any previous occasion.

"Bombs were dropped in Norfolk, Lincolnshire, Staffordshire, Suffolk, Leicestershire, Derbyshire, the number being estimated at 220. Except in one part of Staffordshire, the material damage was not considerable, and in no case was any military damage caused. No further casualties have been reported, and the figures remain as: "54 killed; 67 injured."

February 3—Zeppelin Wrecked—Admiralty Report: "A fishing trawler has reported to-day (February 3) to the Naval Authorities that she had seen a German Zeppelin in the North Sea in a sinking condition."

February 5—Aerial Activity near Ypres—Hostile aircraft has shown some activity about Ypres.

February 6—Five Enemy Machines Driven Down—On February 5 there were 28 combats in the air. In five cases German machines were driven down in the German lines and a sixth machine was forced to descend with a stopped engine and a broken propeller. One of our machines, which went out on reconnaissance duty, did not return. The winch of a hostile captive balloon was struck by a shell and the balloon broke loose.

(See German report)

FRANCE

January 31—Second Raid on Paris—Official *communiqué*: "A German dirigible travelled in the direction of Paris, where it arrived shortly after ten o'clock, and was fired on by our special batteries and attacked by our aeroplanes before sailing towards the north. It threw a certain number of bombs, which, according to the news received so far, caused no damage."

February 5—Enemy Aeroplane Brought Down—About 11.30 this morning (February 5) Sergt. Pilot Guynemen engaged an enemy aeroplane in the Frise district and brought it down in flames between Assevillers and Herbecourt. This is the fifth enemy machine brought down by Sergt. Guynemen.

Sergeant Guynemen's first three exploits occurred on December 5, 8, and 11 last. On December 14 he added a Fokker to his record. The latest fight was dramatic. The two aeroplanes circled round one another for several minutes, firing at point-blank range. Then the sergeant rose suddenly above his antagonist and by a superb feat of airmanship emptied his machine gun at the enemy monoplane. The German fell headlong to the ground, while the Frenchman returned to camp badly winged. Despite his youth he already wears the Cross of the Legion of Honour, the Military Medal, and the War Cross with six palms.

February 6—German Kite Balloon Brought Down—Yesterday (February 5) one of our aeroplanes, mounting a gun, attacked, south of Péronne, a "Drachen" (German kite balloon), which fell to the ground wrapped in flames.

RUSSIA

February 1—Enemy Convoys Bombarded—In the region of the village of Godutsishki, east of Svientsian, our aviators bombarded enemy convoys and a train near Lake Narotch.

February 3—Enemy Aeroplane Brought Down—On the middle Strypa front our artillery brought down an enemy aeroplane, which fell in the enemy lines near Novastavze Zelena.

February 4—Enemy Lines and Convoys Bombarded—During an aerial reconnaissance to the north of Lake Narocz, our aeroplanes, despite a violent fire from the enemy artillery, bombarded the enemy lines and convoys which they had noticed on the Vidzy road. They escaped without injury from the fire of the enemy's artillery, both heavy and light. On the front of the middle Strypa one of our aeroplanes threw bombs on the station of Erzerna and on the rolling stock there. North-east of Czernowitz our heavy guns, supported by aeroplanes, bombarded the enemy batteries in the district of the Toporowce and Rarancze villages.

February 5—Zeppelins over Dvinsk—A large number of German aeroplanes flew over our position at Dvinsk and some Zeppelins were observed.

(See German report)

February 6—Bombs on Mitau—The flights of German aircraft over the district of Riga and south of Uxkull continued. Our aviators dropped bombs on Mitau, and the railway station and the bridge on the River Aa.

AUSTRIA

February 4—Bombs on Russian Communication Centre—An Austro-Hungarian aerial squadron bombarded the Russian communication centre at Szninsk, situated to the east of Kreumieniec. Numerous buildings were set on fire.

GERMANY

January 31—Raids on Paris—In reply to bomb-throwing by French aeroplanes on the open town of Freiburg, which lies outside the zone of operations, our airships during the last two nights (January 29 and 30) have delivered attacks on the fortress of Paris with apparent satisfactory success.

(See French Report)

February 1—Attack on Salonika—One of our airships attacked vessels and stores belonging to the Entente in the harbour of Salonika with good results.

February 2—French Aeroplane Brought Down—A large French aeroplane was caught by our anti-aircraft guns and fell down south-west of Chauny. The occupants, who were wounded, were taken prisoners.

February 3—Allied Aeroplanes Shot Down—Our aviators shot down a British and a French battle aeroplane near Péronne. Three of the occupants of the two machines were killed, and one French observer was severely wounded.

[Another report states that "a Franco-British battle-plane" was brought down. The first account is probably correct.—Ed.]

February 4—French Aeroplane Captured—To the west of Marle a French biplane, the pilot of which had lost his way, fell undamaged into our hands.

February 4—Raid on Salonika—Our aviators in the Vardar valley, south of the Greek frontier, and near the landing-place and harbour of Salonika, observed extensive conflagrations.

February 4—Loss of L 19 Confirmed—The following official *communiqué* was issued by the German Admiralty:—"The naval airship L 19 did not return from a reconnoitring cruise. All investigations have proved fruitless. According to a Reuter telegram the Grimsby trawler King Stephen sighted on the 2nd inst. an airship floating in the North Sea with her cars and the gasbag partly submerged. The crew were on the upper part of the balloon. Their request for rescue was refused by the English trawler under the pretext that her crew was weaker than that of the airship. The trawler returned to Grimsby."

February 5—Dvinsk Attacked—One of our airships attacked the fortifications of Dvinsk.

February 6—English Biplane Forced to Descend—Near Bapaume an English biplane was compelled to descend. The occupants were taken prisoners.

(See English report)

FROM OTHER SOURCES

ENGLAND

February 1—British Aeroplane Found near Dieppe—A fishing vessel this morning (February 1) recovered, eight miles from this port, a chaser-plane piloted by a British officer, who had been obliged to descend as the result of a breakdown. The machine, which was damaged, was towed to land.

February 2—German Comment on the Raid—The German newspapers, accepting the German official version of the Zeppelin raid on England, rejoice over the exploits of their dirigibles. The *Hamburger Nachrichten* says:—

"In England the people were living happily and free from care in the midst of war, while labourers were earning good money. Then the Zeppelins came out of the night and taught the haughty people that the war can overtake them everywhere, and that it is bloody, terrible, and serious. England's industry, to a considerable extent, lies in ruins. England's own soil has been ploughed up by the mighty explosive shells of German air squadrons. Over England herself during the night there was a fierce and hard-fought battle, a devastating air-battle fought on a front of many miles, and it was won by German airships. They returned proud and safe from the fierce battle. England can now contemplate the ruined centres of her industry and trade to which she has been brought by the wicked policy of her statesmen."

February 3—"L 19" Wrecked—The crew of the steam trawler *King Stephen* state that on Wednesday morning (February 2) just before daybreak, their attention was attracted by lights flashing at a distance. They appeared to be signals proceeding from a steamer in distress, but on going closer to investigate, the skipper of the *King Stephen*, William Martin, discovered a huge mass of wreckage on the water. The trawler stood by until daylight, when it was found that the wreckage was that of a large German airship, bearing the identification mark "L 19." The cabins of the Zeppelin were under water and part of the envelope was also submerged, but there was a large portion above water still floating with a good deal of buoyancy. On a raised platform on the top of the envelope were seven or eight members of the airship's crew, who hailed the men of the trawler in broken English, saying, "Save us, save us! We will give you plenty of money."

The group on the platform was soon increased by a number of other men, who came up a companion-way leading up to the platform. The fishermen counted 22 Germans, and the crew of the trawler declare that they heard sounds as of hammering proceeding from the interior of the airship, which led them to believe that there were even more men on board, either attempting to effect repairs or imprisoned in some part of the airship. The trawler carried a crew of only nine hands, and had no weapons. The skipper felt that it would be injudicious to take the Zeppelin crew on board, as the Germans outnumbered his own men. He feared further that they might take possession of the trawler and carry it as a prize to Germany. He, therefore, left the wreckage and proceeded in search of a British Naval vessel, to which he reported the occurrence. The captain of a French vessel which arrived at Hull on February 3, reports seeing a Zeppelin destroyed in the North Sea on Wednesday, February 2.

[It was previously reported that the "L 19" had been fired upon by the Dutch while flying over Holland on the morning of February 1.—Ed.]

February 3—Collier Sunk by Zeppelin—It is possible that the Zeppelin found in a sinking condition on Wednesday morning (February 2) was the raider which at half-past ten on the previous night (February 1) sank the *Franz Fischer*, a captured enemy vessel employed as a coasting collier, drowning thirteen men out of a crew of sixteen. The three survivors are J. Birch, chief engineer (South Shields); W. Taylor, steward (London); and C. Hillier, seaman (Newfoundland). Hillier stated that they left Hartlepool at two o'clock on Monday (January 31) afternoon. The crew numbered sixteen. "About 10.30 on Tuesday night," he said, "we heard a noise overhead such as I have never heard before. Presently a Zeppelin came right on top of us and dropped a bomb of a highly explosive character. There was a violent explosion, and the ship only remained afloat for two minutes. The bomb dropped somewhere round by the engine-room. After the explosion there was no time to think of the boats. We were dragged underneath the water, and when I came up again I caught hold of a lifebelt. Later, after I had been swimming in the water, I came across my two companions, the chief engineer and the steward. They also had lifebelts on, and by the aid of these we were able to keep afloat in the water for an hour. It was pitiful to hear the cries of some of the other men who had come to the surface. After the disappearance of the vessel their cries died away, and we neither heard nor saw them any more. We shouted for help, and when we had almost collapsed through being immersed in the water we met a Belgian steamer, which, however, was unable to pull us aboard. A small boat was immediately lowered, into which three of us were assisted. By this time we were all about unconscious. I came round first, and the other two also regained their senses. Subsequently another vessel came along, and we were transferred to it and taken to London, which we reached at 1.30. I travelled back to West Hartlepool this morning."

February 6—Prisoners to Construct Zeppelin Sheds—One of the British prisoners who arrived at Roosendaal on February 6 from Germany for exchange states that a working party was sent to North Germany, and on arrival found that they were expected to construct Zeppelin sheds. They refused, and eight men were consequently sentenced to 12 months' imprisonment with hard labour. They appealed and the case is to be heard in Berlin. Meanwhile the sentence holds good.

FRANCE

January 28—Fatal Accident—Yesterday (January 27), about four o'clock, at the Bourget aerodrome (near Paris) an aeroplane piloted by a sub-lieutenant fell from a height of 2,000 ft. The machine was completely destroyed and the aviator killed. The latter, who had been awarded the military medal, the Croix de Guerre, and three times mentioned in despatches, received his promotion last week.

January 28—Two French Officers Prisoners—The following announcement is made relating to the French machine which was obliged to land in the German lines after the successful raid on Metz: "But German prisoners, who have just been brought from Toul, state that the officers piloting this machine succeeded in absolutely destroying it before being made prisoners. One of the officers, they inform us, was Captain Legraud, pilot, the other officer was Lieut. Lioche."

January 29—Aviator Drowned in the Sea—It is reported from Saint-Raphaël that the aviator Janvier, naval lieutenant, yesterday (January 28) fell into the sea with his aeroplane and was drowned.

February 1—Attack on Paris Foiled—Last night (January 31) at 9.45 the "listening posts" between Soissons and Compiègne reported the presence of a German dirigible north of Compiègne. The searchlights along the front succeeded in locating it almost immediately and the Zeppelin, which was flying at a great height, endeavoured by zig-zagging to escape from the searchlights. It turned off to the left, but finally came back on its original course and headed at great speed in the direction of Paris. The special batteries at once came into action, and the air flotilla, which had risen to meet it, barred the road. The Zeppelin appeared to have been hit, for, for a brief moment, it listed slightly, but the damage cannot have been serious. By eleven o'clock the "safety" signal was again given to Paris.

February 1—Aviator Killed—An aeroplane fell in a field near Aulnay-sous-Bois. The aviator was killed.

February 4—Zeppelin Spies—The correspondent of *The Morning Post* writing from the East of France, states:—"The Zeppelin raids in the district have done no damage at all. Indeed, one might almost defy them to do any damage, for the little townships, nursed in the laps of the rolling hills, are so darkened that their position at night is nearly unplaceable. In this respect, however, there happened a sequel to the last raid that is not without significance. The Zeppelin had been chased away after discharging harmlessly a number of bombs that fell in fields (this is not an official euphemism, because I have seen the holes) when a fire broke out in a small workshop situated at a most interesting point. It blazed up surprisingly, and its origin has not been satisfactorily established. I am assured on all hands that there are German spies and agents everywhere."

February 4—Fatal Accident in France—A pupil from the air station of Ambérieu, flying a biplane, struck some trees near Trévoux and was killed on the spot.

RUSSIA

February 4—Bombs on Ammunition Train—As a retort for the German air raid on Dvinsk, Russian aviators violently bombarded the military buildings at Poniewietz, and destroyed a long stretch of the railway line and blew up an ammunition train.

February 6—Powder Magazine Exploded—During a recent Russian air raid a powder magazine was exploded and caused considerable loss of life.

February 6—German Aerial Activity—A message from Petrograd states: "Though the enemy's present aerial activity is generally regarded as a precautionary measure, military authorities are quite alive to the possibility of the extension of the purely aggressive and destructive forays of German perfected aeroplanes and Zeppelins with the advent of spring. There are grounds for believing that the enemy contemplates making frequent flights with these machines, both singly and in squadrons, in order to terrorise not only the army but the peaceful inhabitants of the zones contiguous to the war theatre. To this end aerodromes and Zeppelin stations are being established at many points of the enemy's rear, notably at Lida (about 50 miles south of Vilna), where a shed is being constructed capable of accommodating several Zeppelins. The chances of a Zeppelin raid on Petrograd are frequently discussed, but, failing the capture of Riga, which would be best fitted to serve as a base, it is deemed unlikely that the enemy would venture to embark on such a perilous enterprise."

BELGIUM

January 27—Allied Aviators Active—According to a despatch from the Hague Allied aviators continually fly along the coast as far as Knocke and Heyst.

January 29—Train Destroyed by Allies' Bombs—It is reported from the Belgian frontier that a train has been completely destroyed at Opwick (Belgium) by the bombs of an allied aviator.

February 6—The Flaming Fokker—The *Petit Parisien* recently published the following:—"One sees the flash of the guns long before the sound reaches one like thunder. Boche artillery does not reply at once. But beneath the grey waters perhaps Zeebrugge submarines are already at work. And behind Lombaertzyde the Fokkers are rising for an aerial attack. Over the sea, under the sea, and in the air there is the same danger. And it is the same day by day. Last week two German aeroplanes darted down on to a cargo boat aground in front of Zeebrugge. Our torpedo-boats replied to them. Too far away to join in action, some Fusiliers Marins, under the orders of an officer, anxiously followed from the beach near by the incidents of the struggle. Their officer had given them the 'Stand at ease.' Suddenly one of the Boche aeroplanes staggered, struck to the heart, its reservoir in flames. The Fusiliers cheered with delight. 'Fix bayonets,' rang out the command. The officer drew his sword to salute the men who were about to die. While the enemy aeroplane in a long trail of purple fell vertically into the sea the order came 'Present.'"

ITALY

Altitude Record—Sub-Lieutenant Guidi, an Italian military aviator, piloting a Caudron biplane with an observer on board, mounted to an altitude of 20,000 ft. in 75 minutes at Miraflore on February 5. [If correct, this constitutes a world's record.—Ed.]

SWITZERLAND

February 4—Italian Aviator's Mishap—An Italian biplane, coming from the direction of Varese, crossed into Swiss territory yesterday afternoon (February 3). Swiss troops immediately opened fire, and the biplane was hit and compelled to land in Switzerland. The pilot was uninjured, and has been interned. The aviator was trying a new biplane, and it was by accident that he flew over Swiss territory.

February 6—Aviators' Escape—The French aviators, Gilbert and Pary, who have been interned in barracks at Zurich since October, 1915, succeeded in escaping on Saturday evening (February 5) in civilian clothes. Their escape was soon noticed and a sharp watch was kept. The two fugitives were discovered at midnight at the railway station at Olten in the train which was taking seriously wounded French soldiers to Geneva. They will be brought back to Zurich to-day (February 6), and an inquiry will be opened to find out exactly how they effected their escape.

CASUALTIES

ROYAL FLYING CORPS

January 31

KILLED

Reed, Lieut. J. S., East Kent Regt., attached R.F.C.

An inquest was held at Aldershot on February 2 on the body of the above officer. Lieut. Reed was acting as observer to Lieut. Burden, who was flying a machine which suddenly made a nose dive and fell to the ground on January 29. Both men suffered serious injuries, and Lieut. Reed died on Monday morning, January 31. The cause of the accident was attributed to flying too slowly to enable the machine to support itself. A verdict of "Accidental Death" was returned, and the pilot was exonerated from blame.

UNOFFICIALLY ANNOUNCED KILLED

January 12

Field, Lieut. C. V. G., 4th Canadian Infantry, attached R.F.C.

Lieut. Charles Valentine Geary Field, 4th Canadian Infantry Bn., attached Royal Flying Corps (killed on January 12), was the only son of Lieut.-Col. Charles William Field, Indian Army, and of Mrs. Field. Aged 20, he was gazetted Lieutenant in the Canadian Infantry in September, 1914.

(This casualty was notified in our issue of February 2)

Lieut. E. S. Wilkinson, 1st London Regt. (Royal Fusiliers) and Royal Flying Corps, was the eldest son of Mr. Spenser Wilkinson, Chichele Professor of Military History. Born in 1890, he was educated at Doon House, Westgate, Marlborough College, and Manchester University. In 1911 he became an engineering student at McGill University, Montreal, and in August, 1914, was at home for the long vacation. On August 4 he applied for a commission in the 1st London Territorial Bn., and in September went with it to Malta. He came home with the battalion in February, 1915, and proceeded to France in March. He was engaged in the action of May 9 near Fromelles and, as machine-gun officer, in that of September 25, when his machine-guns were destroyed and he was blown up, but not wounded, by the enemy's high-explosive shells. In October he was attached to the 1st Squadron, Royal Flying Corps, as observation officer. On January 12 he set out on an aerial reconnaissance, from which he did not return, and it is now known that he was killed in an aerial fight.

January 17

Hayward, Lieut. Charles Oswald, 7th Lincolnshire Regt., attached R.F.C.

Lieut. Charles Oswald Hayward, 7th Lincolnshire Regt., attached R.F.C., previously reported missing, is now stated to have been killed on January 17. Lieut. Hayward, who was 21 years old, was educated at Repton, and on the outbreak of war was at Pembroke College, Cambridge. He obtained his commission in the 7th Lincolnshire Regt. in September, 1914, and went to Flanders in July, 1915. He joined the Royal Flying Corps just after Christmas.

February 4

Penn-Gaskell, Major L. Da C., R.F.C.

Major and Squadron Commander Leslie Da Costa Penn-Gaskell, R.F.C., who died on February 4 from injuries received on duty, was 34 years of age, and the elder son of Mr. and Mrs. A. B. Penn-Gaskell. He was formerly in the Norfolk Regt. (gazetted lieutenant in October, 1914). Transferring to the Royal Flying Corps he received rapid promotion, and was temporary captain and flight commander in April, 1915.

Second Lieut. Harold Richard Johnson, 3rd Squadron, Royal Flying Corps, killed in a flying accident in France on January 19, was the younger son of the late Mr. and Mrs. William Johnson, of Hambledon, Tonbridge. He was born and educated at Tonbridge, and served five years with the West Kent Yeomanry. He took up flying and obtained his pilot's certificate at Hendon in November, 1913. He then went to Australia, but on the outbreak of war hastened home to offer his services. He received a commission in the Royal Flying Corps and went to France in August, 1915, taking part in the battles of Loos and Hulluch.

(Lieut. Johnson's death was notified in our issue of February 2.)

PREVIOUSLY OFFICIALLY REPORTED MISSING, BELIEVED KILLED, NOW UNOFFICIALLY REPORTED KILLED

Ledger, Second Lieut. H. M. C., I.A., Reserve of Officers, attached R.F.C.

WOUNDED

January 20.

Sawyer, Second Lieut. Reginald H., R.M., R.M.A. Anti-Aircraft Brigade.

January 24

Nott, 2341 Corp. C., R.F.C.

APPOINTMENTS

ROYAL NAVAL AIR SERVICE

Wing Commander:

S. F. Lambe, granted the rank of Acting Capt., with seniority of January 29.

Lieut.:

H. C. Arnold-Forster (emergency), to the *President*, additional, for Admiralty: January 31.

G. G. R. Fraser, entered as Probationary Flight Sub-Lieut., for temporary service, with seniority of January 21, and appointed to the *President*, additional.

Flight Lieut.:

W. C. Michie, to the *President*, additional, for Air Department, Admiralty: February 1.

R. W. Fraser, granted a temporary commission as Sub-Lieut. (R.N.V.R.), with seniority of February 1, and appointed to the *President*, additional, for R.N.A.S.

Commander (R.N.):

C. R. Dane, graded as Wing Commander, with seniority of December 16, and appointed to *President*, additional, for R.N.A.S.

Lieuts. (R.N.V.R.):

Viscount Tiverton and A. H. Peacock, both to *President*, additional, for R.N.A.S., to date February 3 and 7 respectively.

Sub-Lieut. (R.N.V.R.):

A. J. Currie, to *President*, additional, for R.N.A.S.: February 3.

The undermentioned have been entered as Probationary Flight Sub-Lieuts., with seniority as follows, and all appointed to "*President*," additional, for R.N.A.S.:

W. E. Robinson and P. S. Kennedy: December 27.

L. S. Breadner: December 28.

H. W. Eades: December 30.

J. A. Shaw: January 1.

W. H. Chisholm: January 3.

F. P. Collins: January 7.

R. Collishaw and E. V. Reid: January 10.

C. B. de T. Drummond: January 12.

D. R. Baylis (Lieut. A.S.C.): February 3.

K. R. Munro: February 4.

Temporary Commissions have been granted as follows:

W. C. Grant, as Lieut. (R.N.V.R.); D. P. Rowland, W. S. Anderson, and A. O. Jones, all as Sub-Lieuts. (R.N.V.R.), with seniority of February 3, and all appointed to *President*, additional, for R.N.A.S.

Hamilton King Paton, has been entered as temporary Lieut., R.N.V.R., and appointed to *President*, additional, for R.N.A.S.: February 4.

Ernest Vincent King-Hall and Cecil Holmes Waghorn, both entered as temporary Sub-Lieuts., R.N.V.R., and appointed to the *President*, additional, for R.N.A.S.: February 4.

Keith Ross Munro and Herbert William Eades, both entered as Probationary Flight Sub-Lieuts. for temporary service, and appointed to *President*, additional, for R.N.A.S.: February 4, 1916, and December 30, 1915, respectively.

Frederick Phillip Collins, entered as Probationary Flight Sub-Lieut. temporary, and appointed to *President*, additional, for R.N.A.S.: January 7.

ROYAL FLYING CORPS

The following appointments are made:—

Squadron Commanders, from Flight Commanders:

Major R. E. T. Hogg, C.I.E., 38th Horse, I.A., and Major J. R. C. Heathcote, Cameron Highlanders: January 17.

Squadron Commanders, from Flight Commanders, and to be Temporary Majors while so employed:

Capt. J. C. Halahan, Reserve of Officers: Capt. L. Dawes, Middlesex Regt.; Capt. T. W. C. Carthew, D.S.O., Bedfordshire Regt., Special Reserve; Capt. A. Shekleton, Royal Munster Fusiliers: January 17.

Lieut. (temporary Capt.) L. G. Hawker, V.C., D.S.O., R.E.: January 22.

Lieut. (temporary Capt.) L. Da C. Penn-Gaskell, Norfolk Regt., and Capt. E. F. Unwin, A.S.C. : January 31.

Wing Adjutant:

Lieut. D. S. Jillings, West Yorkshire Regt., from a Flying Officer, and to be temporary Capt. whilst so employed : January 25.

Flight Commanders, from Flying Officers, and to be temporary Capt. whilst so employed:

Temporary Second Lieut. T. S. Impey, General List, and Second Lieut. H. V. Champion de Crespigny, Suffolk Regt., and to be seconded : January 12.

Second Lieut. D. C. Ware, King's (Liverpool Regt.) : January 13.

Capt. G. Henderson, 38th Central India Horse, I.A. : January 19.

Temporary Capt. W. Milne, General List : January 20.

Lieut. A. Payze, Special Reserve : January 20.

Temporary Second Lieut. P. G. Ross-Hume, General List, and Second Lieut. K. K. Horn, Special Reserve : January 23.

Temporary Second Lieut. H. S. Shield, General List (now Second Lieut. North Staffs Regt.) : January 24, and to be seconded from January 30.

Flying Officers:

Second Lieut. Robert C. L. Holme, Prince Albert's (Somerset Light Infantry), and to be seconded; Capt. K. E. Kennedy, Canadian Artillery; Temporary Lieut. W. E. G. Murray, Highland Light Infantry, and to be transferred to the General List; Capt. Maurice G. Lee, 40th Pathans, Indian Army; Lieut. George D. Hill, 7th (Queen's Own) Hussars, and to be seconded; Temporary Capt. R. H. Austin-Sparks, R.A., and to be transferred to the General List; Lieut. Gordon R. Elliott, 3rd (Prince of Wales's) Dragoon Guards, and to be seconded; Capt. Lancelot Prickett, R.A., and to be seconded; Lieut. John Nichol, Royal Scots Fusiliers, and to be seconded; Temporary Lieut. A. J. Evans, General List; Second Lieut. Edward W. Leggatt, The Duke of Edinburgh's (Wiltshire Regt.), and to be seconded; Temporary Second Lieut. A. Ellison, General List; Temporary Second Lieut. H. H. Watkins, R.A., and to be transferred to the General List; Second Lieut. Geoffrey J. L. Welsford, Duke of Cambridge's Own (Middlesex Regt.), and to be seconded; Temporary Lieut. G. Graham, General List; Lieut. Herbert B. Russell, R.A., and to be seconded; Temporary Second Lieut. J. K. Summers, General List; Lieut. Reginald H. Marshall, Northamptonshire Regt., Special Reserve, and to be seconded; Second Lieut. Robert L. Chidlaw-Roberts, Hampshire Regt., and to be seconded; Lieut. Theodore E. Longridge, A.S.C.; Lieut. Norman A. Browning-Paterson, R.A., and to be seconded; Second Lieut. C. H. Tayler, Indian Army Reserve of Officers; Temporary Lieut. E. L. Foot, Oxfordshire and Buckinghamshire L.I., and to be transferred to the General List; Temporary Second Lieut. H. F. C. Cannell, R.E., and to be transferred to the General List; Second Lieut. Archibald H. Goldie, Bedfordshire Regt., and to be seconded : October 21, 1915.

Temporary Lieut. A. J. Child, London Regt., T.F., and Lieut. Gordon Alchin, R.F.A., Special Reserve : November 22, 1915.

Temporary Lieut. J. M. E. Shepherd, Rifle Brigade (Prince Consort's Own), and to be transferred to the General List, and Second Lieut. A. R. L. Goodson, London Regt., T.F. : November 27, 1915.

Lieut. Arthur F. Baker, Duke of Cornwall's Light Infantry, Special Reserve, and to be seconded : December 15, 1915.

Capt. Charles L. M. Scott, Prince of Wales's (North Staffordshire Regt.), Special Reserve, and to be seconded : January 2.

Lieut. E. W. Farrow, Motor Machine Gun Service, Canadian Artillery, and Second Lieut. (temporary Lieut.) T. L. Purdom, King's Own Scottish Borderers, T.F. : January 18.

Lieut. John A. G. De Courcy, R.A., and to be seconded; Temporary Lieut. J. M. M'Alery, Royal Irish Rifles, and to be transferred to the General List; Second Lieut. Edward H. Grant, Princess Louise's (Argyll and Sutherland Highlanders), and to be seconded; Temporary Second Lieut. H. C. Hopkinson, King's (Shropshire Light Infantry), and to be transferred to the General List; Lieut. Herman W. von Poellnitz, Lincolnshire Regt., and to be seconded; Lieut. Clifford J. Hart, Worcestershire Regt., Special Reserve, and to be seconded; Temporary Second Lieut. S. W. Price, attached Leicestershire Regt., and to be transferred to the General List; Temporary Second Lieut. H. F. Mase, Norfolk Regt., and to be transferred to the General List; Temporary Second Lieut. C. R. Cook, Northamptonshire Regt., and to be transferred to the General List; Second Lieut. G. W. P. N. Burden, East Lancashire Regt., and to be seconded; Second Lieut. John V. Nash, Special Reserve; Second Lieut. Alexander T. Watson, Special Reserve : January 20.

Second Lieut. G. MacD. Turner, Alexandra, Princess of Wales's Own (Yorkshire Regt.), T.F., and Second Lieut. Edward G. Landon, Special Reserve : January 22.

Second Lieut. D. M. Tidmarsh, Royal Irish Rifles, Special Reserve, and to be seconded : January 13.

Capt. G. A. C. Cowper, 8th Infantry Bn., Australian I.F. : January 14.

Lieut. C. W. Battye, Royal Berks Regt., and to be seconded, and Second Lieut. L. W. Hall, Border Regt., and to be seconded : January 15.

Lieut. W. R. S. Humphreys, 5th Canadian Infantry; Second Lieut. (temporary Lieut.) D. P. B. Taylor, 3rd Hussars, and to be seconded; Second Lieut. W. Brass, Surrey Yeomanry, T.F.; Second Lieut. G. H. Birley, Royal West Surrey Regt., T.F.; Temporary Second Lieut. R. C. Stoddard, South Lancs Regt., and to be transferred to General List; Temporary Second Lieut. W. N. Thomas, King's Shropshire Light Infantry, and to be transferred to General List; Second Lieut. G. H. McLachlin, Special Reserve; Second Lieut. H. A. Johnston, Special Reserve : January 18.

Temporary Lieut. G. W. Hodgkinson, 2nd Co. of London (Westminster Dragoons) Yeomanry, T.F. : January 19.

Assistant Equipment Officers:

Capt. W. E. G. Statter, Royal Lancashire Regt., and to be seconded : January 11.

Second Lieut. (temporary Lieut.) R. G. Burder, A.S.C., Special Reserve, from a Flying Officer, and to relinquish his temporary rank : January 15.

To be Temporary Second Lieuts. for duty with the R.F.C.:

Pte. Donald W. Clappen, from London Regt., T.F. : October 23, 1915.

Serg. Francis G. S. Williams, from Royal North Devon (Hussars) Yeomanry, T.F. : November 22, 1915.

Corp. Malcolm L. Taylor, from R.E. : December 29, 1915.

ATTACHED TO HEADQUARTER UNITS

Brigade Commander:

Lieut.-Col. E. B. Ashmore, C.M.G., M.V.O., R.A., from a Wing Commander, R.F.C., and to be temporary Brig.-Gen. whilst so employed : January 30.

SPECIAL RESERVE

The date of appointment of Second Lieut. (on probation) R. K. Muir is December 13, and not as stated in *Gazette* of January 17.

The date of appointment of Second Lieut. (on probation) E. Duveen is December 13, and not as stated in *Gazette* of January 14.

Second Lieut. (on probation) H. A. Johnston is confirmed in his rank.

To be Second Lieuts. (on probation):

H. H. M. Fraser : December 8.

V. P. Spurway, G. C. Burnand, and F. C. Rowe : January 10.

H. L. Saunders : January 28.

C. R. Fry : February 1.

Following Second Lieuts. (on probation) are confirmed in rank:

E. G. Landon, J. V. Nash, and A. T. Watson.

To be Second Lieuts.:

H. J. Poole and E. W. Bowen : December 22.

Second Lieut. (on probation) G. H. McLachlin is confirmed in rank.

PATENT INFORMATION

This list is specially compiled for AERONAUTICS by Messrs. Rayner and Co., of 5, Chancery Lane, London, from whom all information relating to Patents, Designs, Trade Marks, etc., can be obtained gratuitously.

LATEST PATENT APPLICATIONS

- | | |
|-------|---|
| 780 | L. Coatalen. Construction of crank-chambers for aviation engines. 18/1/16. |
| 726 | J. W. H. Dew. Process for the treatment of the fabric of aeroplane wings, etc. 17/1/16. |
| 1,014 | H. Holmes. Aeroplanes. 21/1/16. |
| 829 | N. V. McKendric. Bomb-dropping aeroplanes. 18/1/16. |
| 799 | J. K. Mackenzie. Method of constructing a working model of a biplane from a printed diagram and extra fittings attached. 18/1/16. |

SPECIFICATIONS ACCEPTED THIS WEEK

- | | |
|-------|---------------------------------------|
| 2,103 | Kamp. Airships or dirigible balloons. |
| 2,233 | Fairfax. Flying machines. |

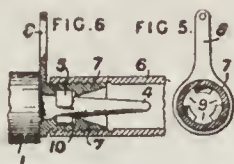
SPECIFICATIONS PUBLISHED THIS WEEK

- | | |
|-------|---|
| 447 | Hayot. Stabilizing means for aeroplanes. |
| 4,525 | Short. Valves for gas-containers employed in airships or in balloons. |

LATEST PUBLISHED ABSTRACTS

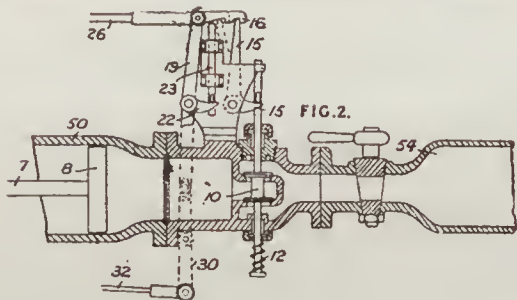
- | | |
|--------|--|
| 20,537 | "Construction of Planes." H. O. Short, 56, Prince of Wales Mansions, Queen's Road, Battersea Park, London. In an aeroplane having folding wings, the sections of the divided wing spar are secured together in the extended position of the wing by a pin-and-socket |
|--------|--|

fastening. In Fig. 6 the pin 4 secured to the spar section 1 is formed with radial projections 5 which enter corre-



sponding slots 9, Fig. 5, in a sleeve 7 screwed into the spar section 6. The sleeve is formed with an annular recess 10, so that on the rotation of the sleeve by the lever 8, the parts are locked together.

20,544 "Starting Flying Machines." P. A. Sparre, 7, Queen's Square, Finsbury Pavement, London. In a device for launching flying machines and comprising a cylinder and piston to which compressed air or fluid is admitted, the valve is gradually opened as the machine proceeds so that the maximum effort of the starting device is exerted at the end of its stroke. The piston-rod 7 is secured to a cross-head sliding on guides and carrying pivoted rods which engage with a transverse bar on the flying machine. Air is admitted from the reservoir 54 through a valve 10 to the cylinder 50. The valve is controlled by a bell-crank lever actuated by a hooked bar 16, which is



pivoted to a rod 26 connected to a bell-crank lever. At starting the pilot moves the rod 26 slightly to the left and after its actuation the pilot abandons the operating-cord. As the piston 8 moves to the left, a pin on the cross-head actuates a lever so that the valve 10 is gradually opened. At the end of the stroke the valve 10 is closed by a spring 12.

Full copies of the published specifications can be obtained from Messrs. Rayner and Co. at the price of 1s.

LEGAL NEWS

GERMAN OFFICERS' TUNNEL

The charges against Flight Lieutenant Otto Thelen, of the German Army Flying Corps, and Lieutenant Hans Keilhack, of the German Navy, for attempting to escape from the Holport German Officers' Internment Camp, were concluded on February 1 at the Military Court at Holport, presided over by Lieutenant-Colonel R. G. Chase.

To the second charge of attempting to escape from the hut into which they were afterwards removed, both prisoners pleaded "Guilty."

At the close of the inquiry the President announced that the Court's decision would be promulgated in due course.

FLASHING LIGHTS

A strange case bearing upon the Zeppelin raid of January 31 was heard at a Lincolnshire Police Court on February 5. A maltster's traveller, well-known in the county, was charged with displaying a light on the night of the raid in such a manner as to serve as a signal. It was alleged that, while distant explosions of bombs dropped from Zeppelins could be heard, prisoner stood on a bridge and flashed a powerful light in the air. Two or three flashes were made at intervals of three or four minutes. The flashes, it was said, were continued for three-quarters of an hour. The magistrate remarked that it was a very serious case, and remanded prisoner, refusing bail.

SOCIAL

Squadron-Commander John Tremayne Babington, R.N., who gained the D.S.O. for his successful air attack on Friedrichshafen in November, 1914, when he dropped bombs on the Zeppelin factory there, was married on February 1 at St. Michael's, Chester Square, to Cecily, youngest daughter of Mr. Philip Beresford Hope.

The marriage took place on February 5, at St. John's Church, Redhill, between the Hon. Alan Boyle, Royal Scots Fusiliers and Royal Flying Corps, third son of the Earl of Glasgow, and Miss Isabel Hull, youngest daughter of Mr. and Mrs. E. C. P. Hull, of Earlswood Mount, Redhill, and sister of the Viscountess Charlemont.

STATE INSURANCE SCHEME

Leaflets have been issued explaining the Government air raid insurance scheme for household goods not exceeding £100 and may be had at any post office. By this scheme 6d. insures £25, 1s. insures £50, and 1s. 6d. insures £75. The risks insured against are destruction or damage caused, whether directly or indirectly, by aircraft (either hostile or other), or shots, shells, bombs, or missiles from aircraft or used against aircraft, or by bombardment from hostile guns not landed on British territory. The period of insurance is 12 months.

GOVERNMENT AIRCRAFT INSURANCE

A meeting to protest against the Government scheme of insurance against damage by hostile aircraft or bombardment was held on February 4 at the Mansion House. It consisted of delegates from thirty-six boroughs, twenty-four rural district councils, and seventeen urban district councils, representing in the main areas situate on or near the East Coast. The Lord Mayor (Sir C. Wakefield) occupied the chair.

Mr. F. Henderson (Norwich) proposed the following resolution:—"That a deputation be formed to wait upon the President of the Board of Trade to urge upon him the views of the local authorities represented at this meeting, which are contained in the following resolution: 'That inasmuch as many of those parts of the country, particularly on the East Coast, in which the risk of damage by hostile aircraft and bombardment, and the consequent need for insurance are greatest, have already suffered, and are likely to suffer, severe financial loss and depression in consequence of the war, and many of the inhabitants of those districts are so impoverished thereby as to be quite unable to pay the premium for such insurances, this Council is of opinion that the Government scheme is unfair in its incidence, and constitutes in effect a special war tax on those who are least able to bear it. And this Council most strongly urges upon His Majesty's Government that the expense of such damage should be borne nationally out of the Imperial revenue.'" The resolution was carried unanimously, and afterwards members of a deputation to wait on the President of the Board of Trade were elected.

BOOKS RECEIVED

"The Flying Machine—Two Papers: The Aerofoil and the Screw Propeller." F. W. Lanchester. London: Institution of Automobile Engineers. 1915. 186 pages, figs. Price 3s. 6d. net.

"The Flyer's Guide." Capt. N. J. Gill, R.A. London: Hugh Rees, Ltd. 1916. 102 pages, figs. Price 3s. 6d. net.

"Instructions for Care and Management of the Beardmore Aero Engine." Reprint from 1915 Handbook.

"Reports on Wind Tunnel Experiments in Aerodynamics." J. C. Hunsaker, E. Buckingham, H. E. Rossell, D. W. Douglas, C. L. Brand, and E. B. Wilson. Washington: Smithsonian Institution. 1916. 92 pages, figs., and 5 plates.

THE SUPPLY OF PETROL

Referring to the notice recently issued by the Shell Co. regarding the possibility of a dearth of petrol, the Anglo-American Oil Co. say:—"So far as we are concerned, there is no shortage of spirit. We are taking care of very large requirements for the Expeditionary Forces and the Admiralty, and, in addition, all the normal requirements of our commercial customers and garage trade."

THE BEARDMORE AERO ENGINE

Aviators who have charge or who are flying machines fitted with the Beardmore aero engine will be interested to learn that a comprehensive book has been published by the company, which gives full instructions for the care and management of the Beardmore aero engine. The book is also valuable to the manufacturer who is installing the Beardmore in his planes, and enquiries for the book to the company's address at 112, Great Portland Street, London, W., will immediately result in a copy being despatched.

THE BRITISH SCHOOL OF AERONAUTICS

We have always advocated in these columns a close co-operation between the theoretical and practical sides of aviation. The days of rule-of-thumb methods have passed, and an efficient air machine can only be built when the strength of every part is scientifically known and size and material adopted accordingly. The call is for still more air machines and more men. But this is quite a new industry, with men to be taught and trained. Scientific precision is necessary. We would therefore strongly advise draughtsmen, fitters, mechanics and a host of others connected with the building and repair of the aeroplane, as well as those engaged in actual flying, to supplement their workshop experience with a theoretical training in aeronautical engineering, such as that provided by the British School of Aeronautics, of 36, Maiden Lane, Strand, W.C., and 254, Oxford Road, Manchester. These courses really supply a national need and are of invaluable assistance to aviation workers at the present time. The charge made is very reasonable, and as the lectures and test papers are given by correspondence they can be taken up anywhere and at any time. The lessons evidently have been drawn up by eminent and practical scientists and omit no essential branch of the subject. The resources of this educational institution are being taxed to the uttermost on account of the absorbing interest that is being taken in aircraft construction during the present national crisis.

AERONAUTICS

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(FOUNDED 1907)

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as a Newspaper

ONE PENNY

"THE AVIATION CRISIS"

SURELY the country cannot be waking up at last from its lethargic slumbers? We have these last few days lived to see the greater portion of the English Press suddenly uttering a concerted howl for the appointment of an Air Minister, for the unification of the air services, and for the placing of the whole system of national aerial defence under one and undivided control. Undignified in the manner of its utterance as this howl may be, it must be admitted not to be devoid of justification. As our readers know, we have consistently striven for these three main reforms for the past three years and had to endure unwarranted criticism from many quarters on this very score. Last week we reprinted a few extracts from previous articles referring to these matters; a few further passages will be found this week in another column. If our object has been attained, and by the time these lines appear such may prove to be the case, our task has not been in vain.

Unfortunately, signs are not wanting, to judge both from our past conduct of the war and from the present hysterical outcry, that unless we preserve a proper sense of proportion our last state will be worse than the first. The present outcry appears to be for an Air Minister with a seat in the Cabinet, in other words, a politician. Among the candidates proposed for the office occur the names of Major Winston Churchill, Lord Curzon, and—Lord Northcliffe! With the qualifications of the first-named, which to our mind peculiarly fit him for the post, we have already dealt. The very suggestion of the latter two is proof of a state of hysteria if not of complete mental derangement, as is all the futile twaddle regarding "reprisals." What earthly qualifications has either for the task, what knowledge of this highly complex technical subject? That the gun defences of London should have been entrusted to Sir Percy Scott is understandable, since he is a fighting man and a gunnery expert, even though he may know little of aeronautics; but a newspaper proprietor or a professional politician! Stay, though, perhaps we are a trifle unjust; Lord Northcliffe, could he but be induced to take charge, might save the country from aerial invasion by decreeing that every one of our intrepid birdmen should wear a sweet pea in his buttonhole, subsist on standard bread, and have his photograph published in the *Daily Mirror*; while Lord Curzon, following the example of a famous naval constructor who is related to have designed his battleships by contemplating a bloater, is no doubt capable of building Zeppelins by virtue of his knowledge of the habits of the Indian "cheal."

Seriously, it is high time that the whole matter was lifted above the level of political controversy. France tried the experiment of placing a politician at the head of its air

service. The inevitable happened; M. Besnard was the object of fierce attacks in the Press, largely on political grounds, and compelled to resign, with the result that control has reverted to the Minister for War, who has appointed a capable soldier as his subordinate. Why, then, with this example before our eyes, it may be asked, now entrust the control of our air service simply to the War Office? Why appoint an Air Minister and create an Air Department? The answer is clear. As we have repeatedly pointed out, the problem of our aerial organisation differs materially from that of France. There it is purely military in its nature. The defence of the country and the aeronautical service of the Army—from a purely practical point of view naval aviation is in this case a negligible factor—are entrusted to the same body, which is competent in the ordinary exercise of its duty to fulfil both functions. If our battle-front lay only in Flanders, the same consideration would apply to our own case.

But it does not. It comprises the major part of our far-flung coastline, the whole of the North Sea and the Channel, and the vast extent of the British Empire and its outlying possessions. From the very nature of the case the national defence of France is military in its character, while ours is primarily naval, though in the last twelve months we have also become a great military Power. But—and the consideration is of the greatest importance—our land forces are fighting on foreign soil, while, in addition, we have to protect our own coasts. This complication alone—not to mention the undoubted rivalry which still exists between the two branches of the air service—requires co-ordination, combined effort, and singleness of control: control in the training of pilots, in production of aircraft, and in the conduct of military operations. The question of reprisals, possessing no military significance, may be left to the faddist and to the ethical philanderer.

Only the change, if a change is to be made, must be radical. Half measures no longer suffice. The public will no longer be content with a reshuffling of responsibility from Mr. Balfour to Sir Percy Scott, and from the latter to Lord Kitchener or even to Lord French. Technically, Lord French may be responsible for the defence of these islands; and in this capacity have charge of the air service at home. Practically, he has no expert knowledge of the question, and, therefore, has no competency. If, by the appointment of an Air Minister is meant the creation of yet another political job, for heaven's sake let us stay as we are. But if the term implies, as it should, unification of control and combined, single-hearted effort, we shall have progressed far towards the attainment of victory.

NOTES OF THE WEEK

Functions of the Technical Press

Imitation, it has been said, is the sincerest form of flattery; on that score I offer no opinion, but only note with gratification that the daily Press, which, after all, to some extent reflects public opinion, almost invariably sooner or later puts forward views long before expressed in the technical Press. This, of course, is all as it should be, for the technical Press may be supposed to know its own business without having to discover it in a moment of scare or panic. Thus with the best means of defence against Zeppelin attack. In the leaders of the *Times* last week I came upon the following passages:—

"Of the possible ways of stopping aircraft raiders the best of all is to destroy them at their base before they start. The next best is to attack them before they reach their goal, whether with guns or with aeroplanes stationed on the Coast."

And a few days later:—

"Without attempting a technical discussion, we have already indicated in a general way the order in which defence measures ought to be undertaken so far as circumstances allow. The best and most effective way to prevent hostile aircraft from coming here is to hunt them out and destroy them 'in their nests.'"

Now several months ago, on September 15, 1915, to be precise, I wrote in *AERONAUTICS*:—

"If, therefore, we are unable to adopt effective counter-measures against a Zeppelin sneaking furtively through the night, the method of attack lies ready to our hand. The great German airship bases are known to us, and a Zeppelin is most vulnerable in its lair, which, with the help of the Navy, is in every case accessible to our air fleet."

It may be thought that this is indeed a veritable orgy of self-glorification, but such is not the case. My purpose in recalling the past is simply to show that the technical Press serves the dual function of representing the industry and the science and of serving as a guide to the public generally in technical matters.

An Offer and its Sequel

I do not know Tonks, of Handsworth, nor, so far as I am aware, does he know me. Probably the congratulations are mutual. But this precious extract I cull from an evening paper:—

"£500 FOR A DEAD ZEP."

"BIRMINGHAM MAN'S NEW OFFER FOR AN AIR VICTORY
NEAR BIRMINGHAM"

"Mr. H. W. Tonks, of Handsworth, near Birmingham, will pay £500 to anyone who succeeds in bringing down a Zeppelin within a radius of five miles of Birmingham."

"I think," he writes in the *Birmingham Mail*, "it is quite time something was done to try and stop this cursed wickedness by Germany." He makes the offer as "an incentive to our Flying Corps to do their best."

As far as I am concerned, good man Tonks can keep his money in his own pocket. He seems to forget that the vast majority of the members of the Royal Flying Corps are Englishmen and gentlemen, and do not require the incentive of his shekels to "do their best." They do, and have been doing, their best for many months past; they have given their lives—and what has man more to give—for the protection of Tonks and his kidney. May I be present at the meeting of Tonks and the aviator when he attempts to present his cheque, for surely never was a more dire insult offered to a brave body of men than this proffered to the Royal Flying Corps by the egregious Tonks.

"Quirk," said the Birdman

As a general rule, I prefer to let Carmelite House stew in its own juice, of which it appears to have a plentiful supply. But for once an exception may be made, since, after all, this paper serves a humble purpose in its capacity as purveyor of delectation to the members of air stations abroad. This morning I had inflicted upon me a copy of the *Weekly Dispatch*. And this is the succulent paragraph culled, together with the heading which appears above, from its leader page. The author is apparently the writer who lunches daily at the Savoy, dines at the Carlton, sups at the

Ritz, and concludes a strenuous day at Lockhart's. Here follows this priceless paragraph:—

"A new slang has sprung up in the flying services. 'A quirk' is a beginner; a flight is a 'joy-ride' or a 'stunt'; an airman's hat is a 'grummet'; a cigarette is a 'gasper,' and should a flying man be unaware of your identity he will address you as 'George.'"

However recondite or, as Sam Weller might have remarked, however extensive but peculiar may be the acquaintance of the writer of that paragraph with the intricacies of airman-ship—as note his happy reference to the "hat"—I would respectfully remind him that he has forgotten one airman's slang term as applied to his own effusion, which sounds like—well, "tommy-rot."

No Snobbery!

Of course Mr. H. G. Wells set the ball rolling, but then Mr. Wells may be excused, being a dreamer and a visionary, a juggler with ideas and not with practical things. For, despite his association with Mr. J. W. Dunne in the early days when the latter was evolving his automatic stability machine, he has no personal acquaintance with practical aeronautics. When, therefore, he leads an outcry for 10,000 aeroplanes for raiding German towns and the enemy's strategic points, he is merely toying with an idea. But anyone professing a practical knowledge of aviation and the industry ought to know better than to ape this cry, which nowadays possesses the merit of neither originality nor practicability. A self-styled authority on the subject, writing to the *Evening News* recently in this strain, perpetrated the following:—

"At the present moment practically all of our service pilots are commissioned men."

"Very few are non-commissioned, and it is regrettable to relate that many certified pilots cannot gain entry into the Flying Service merely because they may be more sensible than gentlemanly."

Setting aside the wholly unmerited slur which these words cast upon our flying services and their organisation, it may perhaps be permissible to remark that the writer in question, to judge from his words, is unlikely to command respect as an expert in either quality.

A Trans-Atlantic Flight

Under present conditions an attempt to fly across the Atlantic may be deemed, shall I say, visionary. Nevertheless, the problem, which is closely bound up with the future of aviation, is engaging the spare time of several members of the air services. I have received the following communication from a correspondent:—

"The success or failure of an attempt to fly across the Atlantic depends on—

The reliability of the power unit.

The reliability of the aeroplane.

Organisation.

Pilots' powers of endurance.

Navigation.

Weather conditions.

A British officer, a serious student of aeronautical science and practice for five years, at present serving in the Royal Flying Corps, would like to communicate with wealthy sportsmen, who, after the war, might finance a well-organised attempt to effect a non-stop flight across the Atlantic in an aeroplane designed and piloted by the advertiser, assisted by a pilot who is also an experienced navigator. Full details will be arranged after the war, but the general scheme has already been formulated. The scheme is thoroughly sound and is not too ambitious, every effort being made to ensure success and eliminate the dangers usually associated with a non-stop trans-Atlantic flight."

All communications will be duly and promptly forwarded to the right quarters.

J. H. L.

THE WINSLOW BOILER

By ROBERT CRAMER

THE Winslow Boiler is essentially a water-tube boiler of the circulating type which is constructed entirely of steel tubing and is devoid of drums or other large vessels. Thus it is capable, with perfect safety, of producing steam of very high pressure. At the same time the fact that the water circulates in the boiler in the same manner as in the largest stationary or marine boilers makes it possible to operate this boiler without using complicated automatic governing devices such as are required in cases of flash and semi-flash boilers.

Essentials of Design

The Winslow Boiler consists of a number of individual sections which are identical in shape and size, each connected at the bottom to a common mud drum and at the top to a common steam drum. From a common feed drum a pipe leads to each section, introducing the feed water at a point where it naturally enters into the circulation.

Figure 1 shows in diagrammatical manner one of these sectional elements in cross-section. The horizontal tubes

joining $3\frac{1}{4}$ in. headers, show that the tube wall would break under a pressure of approximately 9,000 lb. per square inch, while the weld remained intact. With small joints test pressures have been carried beyond 10,000 lb. per square inch without injury to either tube or weld.

Thus all joints exposed to the action of the furnace consist of solid metal. All other types of joints which occur, such as connection to the mud drum, the steam drum and the feed pipe, are located in the last pass of the gases, which is always comparatively cool.

Operation

Referring to diagram Fig. 1, we notice that the furnace is located in front of the baffle below the nest of tubes. The sweep of the gases is indicated by arrows. The natural result of the intense heating of the lower part of the nest of tubes is a circulation of the water forward in the horizontal tubes and upward in the front header. This rising water returns to the rear header through the upper part of the horizontal tubes, while the steam which has been formed is separated, and collects in the uppermost part of the section. Thus the circulation is essentially the same as in large water-tube boilers. The possibility of this is apparent if we

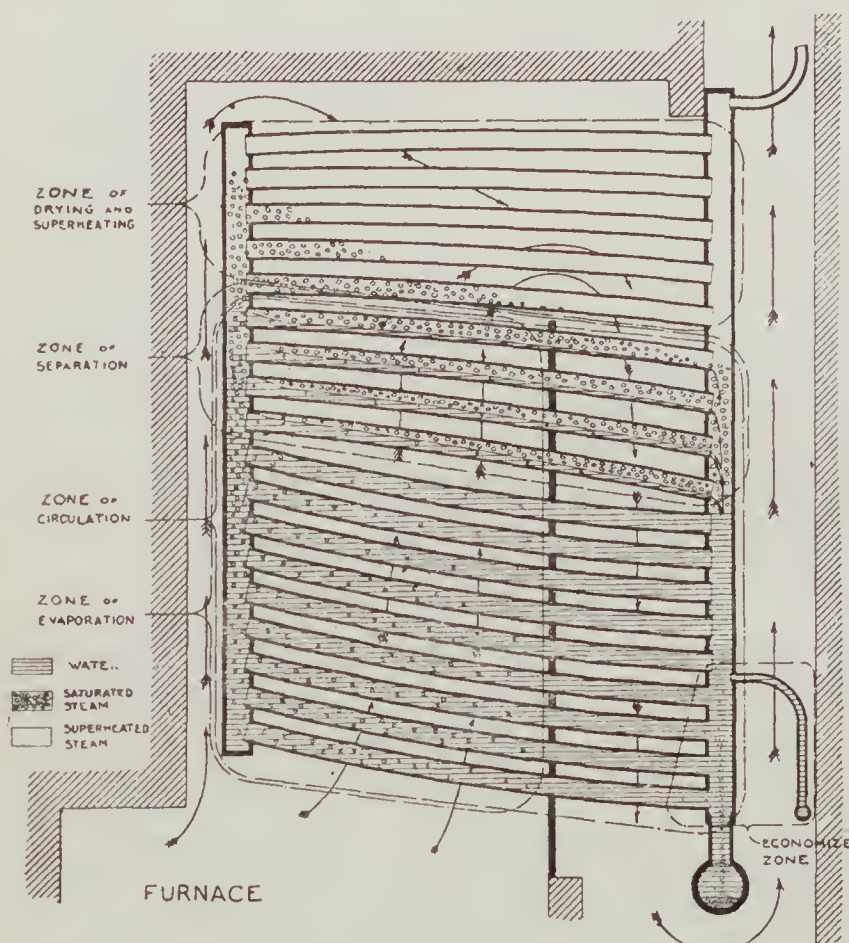


Fig. 1

which form the heating surface connect the front and rear headers. Fastened to the horizontal tubes is a baffle, indicated in the diagram by a heavy black line. Each baffle is in contact with that of the adjoining section, and all baffles in this manner form a continuous baffle wall extending across the nest of tubes.

Figure 2 shows a number of such sections assembled into a complete boiler unit connected to the steam drum on top. The mud drum connections are shown, but the mud drum itself does not appear in this illustration. The feed drum and connections are also absent.

Joints

Where the horizontal tubes connect to the headers they are joined by means of acetylene welding. These welds are made so carefully that, with the extra material added, they are considerably stronger than the original unwelded tube. Tests, which have been made with tubes of 2 in. diameter

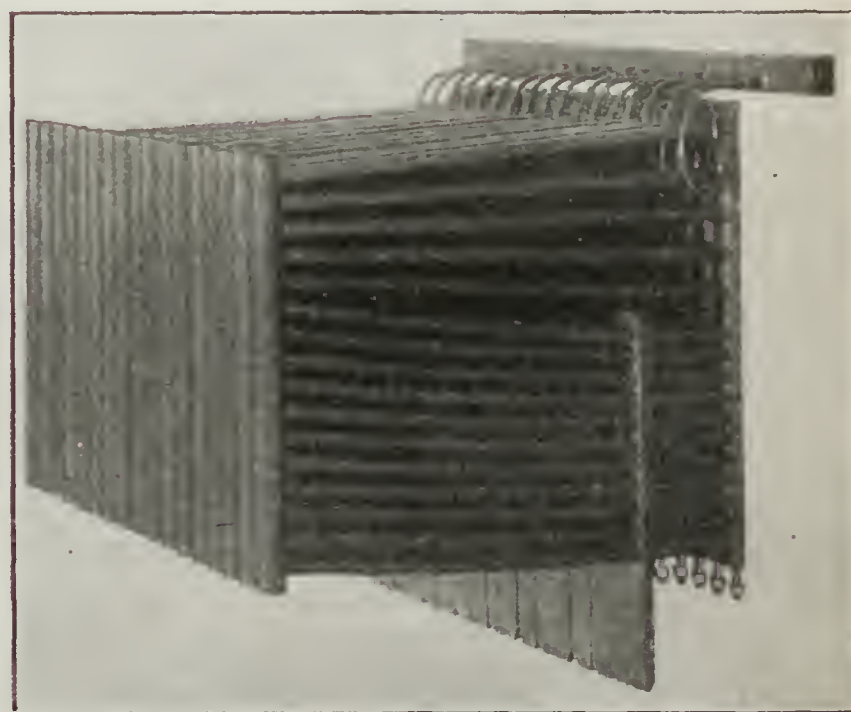


Fig. 2

consider that in the drum of a large water-tube boiler, which forms the return flow element, the motion of the water is essentially in a horizontal direction, and would, therefore, not be interfered with if the drum would be resolved into a nest of horizontal tubes.

In the diagram there is indicated a space between the front header and the front furnace wall. This allows a certain portion of hot furnace gas to pass over the top part of the section without first passing through the heating surface. The effect of this extra stream of gas is to dry, and even slightly superheat, the steam before it enters the connection to the steam drum. Where higher degrees of superheat are desired, a special extension of the section is provided for that purpose.

Advantages of Winslow Construction

Fig. 3 shows a metal casing suitable for the boiler illustrated in Fig. 2. The burner is bolted to the bottom of the boiler casing and uses liquid fuel. It is apparent that nearly the whole space occupied by this boiler is filled with heating surface. The boiler illustrated can easily be placed within a cube of 2 ft., and it contains a heating surface of

approximately 100 square feet. The horizontal tubes in this case are $\frac{5}{8}$ in. in diameter, and the heating surface can be even more concentrated by using still smaller tubes.



Fig. 3

The sectional construction makes it possible to remove any one section at any time quickly and easily.

Fig. 4, which shows another type of Winslow Boiler, makes this very plain. After opening the door at the rear

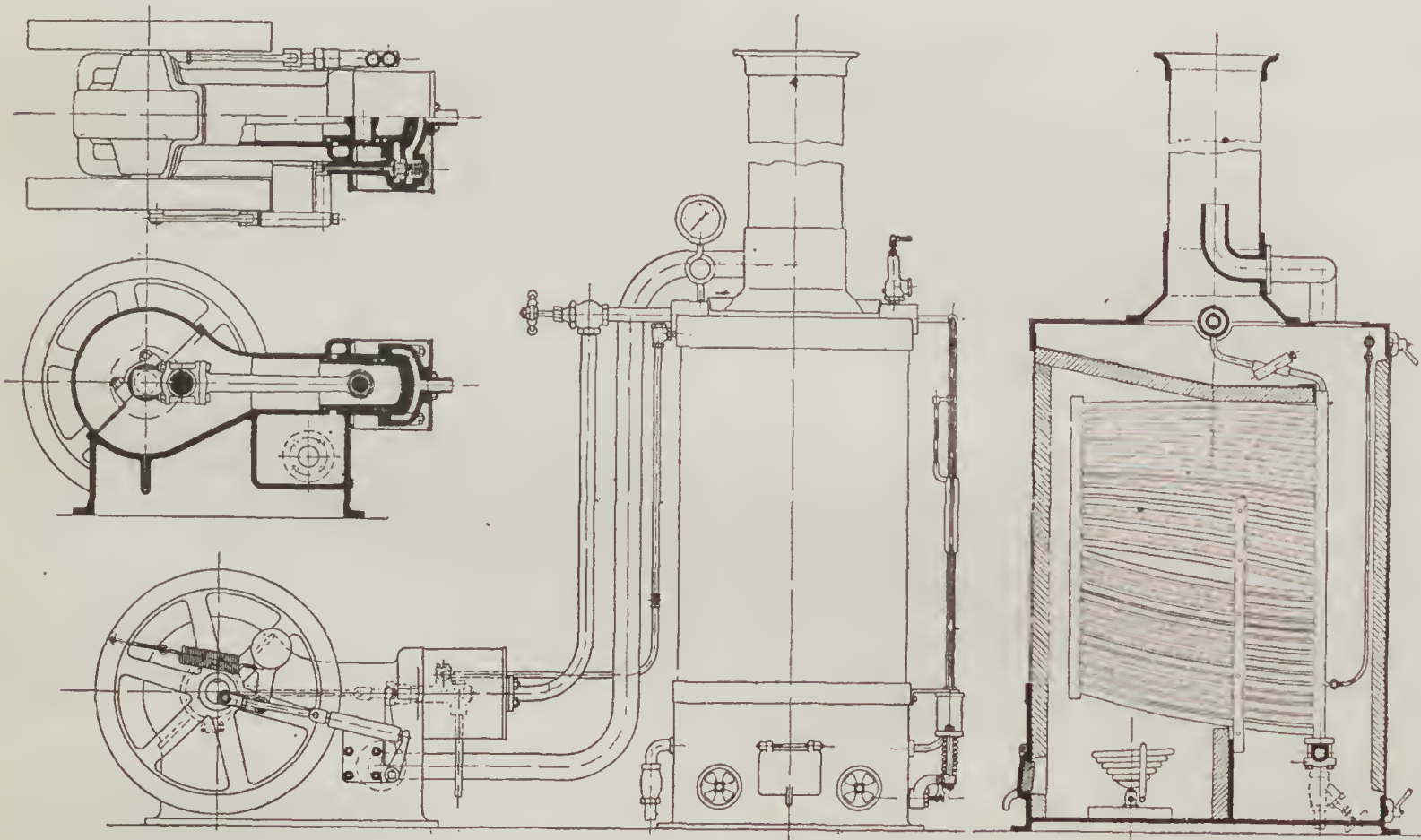


Fig. 4

of this boiler the joints are easily accessible, and any section can be readily removed through this door. Thus, in case of damage to any tube, a new section can be put in place of the damaged one with very little loss of time. In emergency, when no spare section is available, the boiler can even be operated after simply removing the damaged section and closing its connections to mud drum, steam drum and feed pipe.

In proportioning the sections the designer has considerable freedom, and it is therefore possible to adapt the boiler to the particular conditions governing its installation.

In cases where feed water is to be used which tends to form scale, openings are provided in the rear headers opposite each horizontal tube. These openings are closed by means of special plugs, and are readily accessible after opening the doors. Thus every tube can easily be cleaned when in place or after it has been removed from the boiler casing. In certain classes of service it would be even desirable, and it is perfectly possible in the case of the Winslow

Boiler, to remove the heating surface entirely from the casing for the purpose of cleaning, and quickly installing in its place substitute sections which have been previously cleaned.

Operating pressures in the Winslow Boiler have been frequently carried to 600 lb. per square inch, and in special cases as high as 1,500 lb. per square inch. The possible gain in efficiency due to such high steam pressures and the possible concentration of the heating surface in very small bulk with very small weight, enables the designer to create a power plant of extremely small weight per unit of power developed, at the same time obtaining all the inherent advantages of ease of control and flexibility which steam has over other methods of producing power.

THE MARKET IN CURTISS SHARES

Some 5,000 shares were dealt in during the week ending January 22. The highest point reached was 58 and the lowest 55 for the common stock. The notes and preferred are being traded in but are not listed on the Kerb.

New York, January 29.—Some 3,500 shares of Curtiss common changed hands during the past week, opening at 55 and settling down to 50 at the close of the six days—the price at which it was originally offered on the Kerb. It once touched 60 on the first day's business. A strong demand is reported for the preferred stock and the notes.

NEW DOPE MANUFACTURERS

The Chemical Products Co., 93, Broad Street, Boston, Mass., is a new entrant in the American field of dope manufacturers. This concern is supplying various manufacturers of aeroplanes with different compositions of varnish. All are, however, made from cellulose acetate non-inflammable base, the essential differences between them being the drying rates and their shrinking properties.

Charles L. Laurance, who has been designing and testing an aeronautical motor in France, has returned to this country and associated himself with the Electric Boat Co., which is interested in the Wright Co. through Henry Sutphen, and is now designing another engine on the lines of the one tested out abroad. This will have a Christensen starter as standard equipment.

The new Thomas hydro-aeroplane for the U.S. Navy will be out for demonstration by the middle of January. The first two of the Thomas eight-cylinder motors have been through long tests, and five are coming through the shops with the refinements suggested by tests, the latest devices, and Christensen air starters.

A total of 3,124 flights were made up to December 1, 1915, by Army aviators at San Diego. The total time was 1,257 hours.

RANDOM REMARKS

XXXVII.—ANCESTRY

By ARTHUR LAWRENCE

I AM not ashamed of my ancestry, although I am not particularly sorry that I know so little about it. So far back as my great-grandfather I feel that I am at home. My fear is that I shall meet with their dis-



approval when I pass over. My great grandfather, whose portrait by Opie I saw when I last electrified Cornwall by one of my rare visits, will possibly say to me: "My dear fellow, I was a J.P., don't you know, and all that sort of thing. I think I set you a decent example, by Gad, and what have you done with it? You spent part of your middle age in writing rot under the title of 'Random Remarks,' illustrated by a bull-necked ruffian with an

ominous name, and——"; but it is just possible that I may have a few more years on this earth. I may yet do mighty things which will earn his respect, or I may fulfil my belief that I shall pop off at the expense of some parish, after making the feeblest jokes at the expense of a kindly workhouse.

Of course this boast of descent is a precious jewel with many facets. It is usually advisable not to enquire into the matter too closely. I have very few friends, and I am not quite sure that I ought to diminish the number. Heraldic folk have to take one thing with another. There are oases, and there are also miasmas. Myself, I do not care to venture into the abysmal past. It was a very reverend dean who told me that I derived my name from the saint. I remarked that I had always understood that the saint was a celibate, and then the Dean changed the subject. Of the Cornish side of me, the Daveys and the Bodelvas, it is enough to say that my grandfather Davey was a maker of ropes, in anticipation no doubt of the manner of my decease, and the old rope-walk is now quite a romantic rendezvous of young lovers. It is on the right bank of the Fal. I mentioned this once when I was staying with the Tangyes of Birmingham. My host displayed quite a keen interest, and said he would tell me how his father ruined my grandfather. It seemed that my grandfather would have nothing to do with any new-fangled notions of making ropes, and one of the Tangyes—who hail from Cornwall—wiped him out. I feel that I could do with a large sum of money just now, although I am not at all clear how I should use it, and it may have been for my benefit that my grandfather refused to move with the times.

I have always been Japanese in my respect for my ancestors. I never think of my splendid physique, my

clear vision and irreproachable morals but I congratulate my ancestors for all they have done for me, and not least for permitting me to shift for myself. I have never had to carry about the dead weight of fortune. If I have ever had a legacy it has not amounted to more money than I could easily spend in a week. This has left me free to develop any tendencies I may have received from the early Phœnicians. It may be remembered that they came to Cornwall looking for tin, and took away the secret of making Cornish cream. It was this which was referred to when, before the killing of Sisera, Jael "brought forth butter in a lordly dish."

I am not quite sure if it has yet been decided whether the Phœnicians were a Semitic race, but, judging from Coffin's sketches of me in the last issue, the late Lord Beaconsfield and myself have sprung from a common stock. I have always found the Jews to be an open-handed and generous race. If they cannot make a living in Scotland I doubt if they will fare any better in Cornwall. I have known eminent financiers go down to Cornwall, prepared to put tin and copper on the right basis, and they have come back to London minus all the hard cash they took with them and nothing to show for it. The Cornish Celt is a simple fellow. He is childlike and bland. He is intensely hospitable, and a hundred years behind the times. Yet if it comes to finance the sort of man he most likes to meet is a Highlander of Jewish descent. Such an one is lucky to escape from the Delectable Duchy in his pyjamas.

One of my mentors, a broad-shouldered fellow, who delights me with his shrewd, homely wit—we call him "The Captain" for short—accused me the other day of being descended from a long line of Cornish wreckers. He remarked that their deeds would make a modern Hun blush with shame. Of course I had to take up the challenge by remarking that the ships

wrecked were lamentably few, and there is no pleasure comparable with that of listening to the shrieks of the drowning whilst you are hauling in a barrel of rum. Yet, apart from this painful persiflage, I might as well claim descent from the men of more recent times who have manned the lifeboats for many long years and, off one of the worst coasts in England, have saved many thousands of lives at the risk of their own. I never indulge in *tu quoque*. I make no attempt to scratch my friend's escutcheon. He may come from Wales, or he may not. It may require many generations of blackguards to produce the one perfect saint. I do not suggest that the reverse of this is true, if his ancestors were peculiarly free from reproach.



PROGRESS OF AMERICAN AVIATION

By E. LARUE JONES, American Editor

NEW MODEL WRIGHT INCIDENCE INDICATOR

SOME changes have been made in the Wright angle of incidence indicator, which is being supplied to competitive companies, as well as on all school and sporting Wrights. It consists of a light air vane (fastened at right angles to a horizontal shaft) which operates a pointer on a dial by a mechanical contrivance which eliminates any gravity influence. The pointer indicates at any time the angle of the chord of the planes with respect to the air currents through which the machine is flying, and, as already stated, is entirely independent of gravity, in distinction to the usual clinometer, which takes no account of ascending or descending currents. The weight is $2\frac{1}{4}$ lb., and the dial can be read clearly at a distance of ten feet. It can be fitted to any type of biplane on a convenient strut, and on a monoplane can be fitted to one of the cabanes or to some member of the chassis. It sells at \$50 (£10).

The use of an instrument showing angles of incidence in the air, so that a pilot, who knows his machine's limiting range of angles, could be sure of remaining within safe flying positions, would save a good many lives.

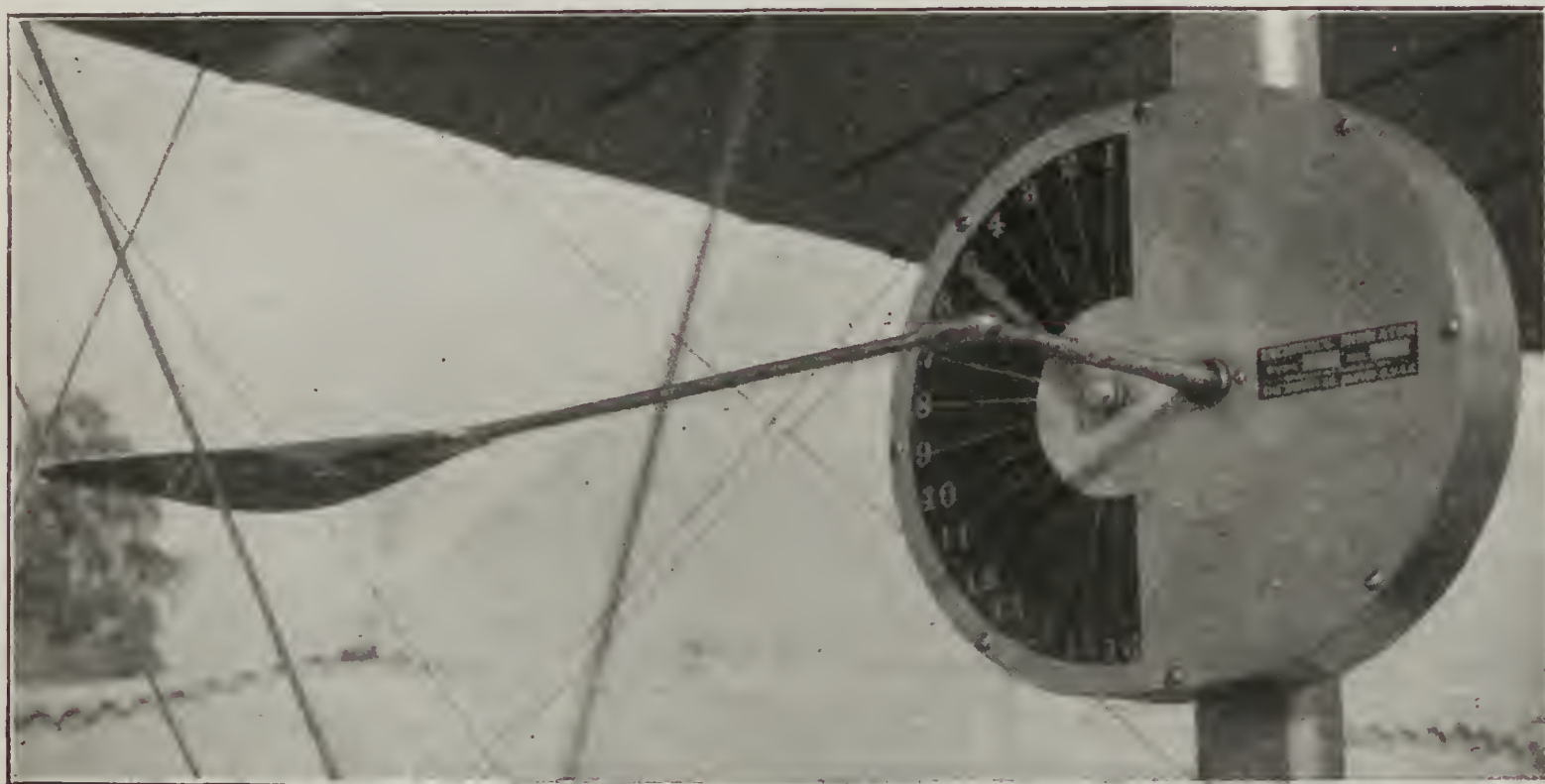
ceeded to turn out one of their own, which has recently come into extended use in Government service.

In ascending or descending currents, to fly properly balanced, the machine may take an angle quite out of proportion to the horizontal, but with this incidence indicator the pilot is positive that the planes are receiving their proper pressure, and that the centre of support has the correct relation with regard to the centre of gravity. It is safe to say that keeping within the range of safe flying angles would eliminate almost 80 per cent. of accidents.

648 AEROPLANES WANTED

GENERAL GEORGE P. SCRIVEN, Chief Signal Officer of the Army, has asked for 648 aeroplanes for the Army in the hearings held by the House Military Affairs Committee. He also asks the repeal of the law requiring student aviators to be unmarried, as fully set forth in AERONAUTICS for January 19, 1916. He stated he figured the capacity of American aeroplane plants to be 20 machines a day.

General Scriven must be labouring under sad delusions, for one "expert" has already stated that one plant alone is



THE WRIGHT INCIDENCE INDICATOR

On climbing, if the machine is set at too great an angle, the lift falls off, the drift increases, and the machine first begins to sink and then in losing headway to "stall." In diving, if the angle is made too small, the centre of pressure moves very far back, and the degree of safety is greatly reduced by its proximity to a position of down pressure on the top of the wing; there is also the possibility in again turning up of receiving a pressure on the under-side of the tail surface, which would prevent the machine's recovering from the dive. There are many now who consider this the principal cause of diving accidents that have taken place.

If in climbing, diving, or in normal flying the air currents are disturbed, rising, descending, or deflecting from side to side, the angle of the machine with the horizontal, which is registered by the ordinary gravity clinometer, does not represent the angle of the planes to the air. This latter, however, is the important thing to know, and, as no such instrument was on the market, the Wright Company pro-

turning out this number daily, and adds gratuitously that this is more than the Army and Navy together have in aeroplane equipment. It is a misfortune that the Army and the Navy cannot see their ways clear to combining in the employment of this "expert" to show them how "it ought to be done."

NAVY AERONAUTIC NEWS

A NEW launching device on the *North Carolina* is being installed and will be finished shortly. Three new hydro-aeroplanes have been received from the Curtiss factory. These are of the school type recently illustrated in AERONAUTICS.

The Gyro-motored Burgess-Dunne seaplane recently made a flight of 1 hour 21 minutes. The hoisting apparatus shown in AERONAUTICS for January 26, 1916, has been rigged up on the torpedo-boat destroyer *Sterrett* by Commander-Lieutenant J. A. W. Simpson.

NEW BURGESS MACHINES

PLANS now under way in Massachusetts promise great activity in aviation during the coming spring and summer. The Naval Reserve and National Guard of the State will surely be equipped with at least three and possibly more aeroplanes. The Aero Club of New England is taking an active interest in this development, and funds are now being raised for the support of the State Flying Service. Two of the machines which will be used are now under construction at the Marblehead plant of the Burgess Co., while work on a third will be started in the course of a few weeks.

One of the craft now under way is the Burgess seaplane to be flown by Godfrey L. Cabot, who is at the head of the movement for the development of the aviation strength of New England. The motor for this machine, a 140 h.p. Sturtevant, recently was put through a six-hour trial run, which was thoroughly satisfactory in every way. The test was made under full load conditions, and there were no indications of trouble at any stage. At a propeller-speed of 1,350 revolutions a thrust of more than 600 lbs. was shown.

There was also shipped by the Burgess Co. last week the first of the three naval war seaplanes now on order there. It has been decided to hold the official tests of this machine at Pensacola under the direction of the authorities at the Navy Training Station. The operator will be aviator Clifford L. Webster, of the Burgess Co. The requirements call for an air speed of 80 miles per hour with full load, the load including 380 lbs. allowance for pilot and passenger; 206 lbs. for tools and instruments; and 400 lbs. of fuel and oil, sufficient for a continuous flight of four hours.

Under the same load conditions the craft must climb at the rate of 250 ft. per minute for ten minutes. The weight of the seaplane, light, is just under 2,000 lbs. Like the Cabot machine, the new war planes are equipped with the 140 h.p. Sturtevant, and there has been no difficulty in fulfilling the requirements in the unofficial trials at Marblehead.

HERRING SUES CURTISS

BUFFALO, N.Y., January 19. An action for \$5,000,000 damages is now in progress by A. M. Herring, one of the most prominent early figures in aviation, against Glenn H. Curtiss, Monroe Wheeler, Lena P. Curtiss, Cortlandt F. Bishop (ex-president of the Aero Club of America), Capt. Thomas S. Baldwin, and the Bank of Hammondsport, stockholders in the defunct Herring-Curtiss Co., which went into receiver's hands some years ago. It is alleged that Herring furnished practically all the plans and ideas used in the Curtiss aeroplane, and he charges that the directors of the above concern organised to oust him and that money was diverted.

The Herring-Curtiss Co. was formed in March, 1909, with a capital of \$360,000, to acquire the patents of Herring and the G. H. Curtiss Manufacturing Co., which was then in the motor-cycle business, save for the work being done for the Aerial Experiment Association, headed by Dr. A. Graham Bell. Mr. Herring obtained 51 per cent. of the capital stock of the combination.

Prior to this, the Aeronautical Society of America had contracted with Glenn Curtiss personally to build and fly an aeroplane of his own design, but it transpired that the machine was actually produced by the Herring-Curtiss Co. This machine was built and flown, and was so successful that a duplicate was rushed to France and it won the first Gordon Bennett Cup. It is claimed by Herring that the curve of this first machine was his.

In 1908 Herring was one of three bidders to furnish an aeroplane to the U.S. Government, and his time for delivery was extended several times and into 1909, but no delivery was ever made. No one has ever told of seeing his machine fly. From the dissolution of the Herring-Curtiss Co. Herring has not been publicly active in the aeronautical field. In the very earliest days he worked for the lamented

Octave Chanute, and did some gliding on the shores of Lake Michigan with the Chanute glider. Mr. Chanute took him to Kitty Hawk on one occasion, where he saw the Wright brothers glide.

STANDARDISATION MEETING NOT OFFICIAL

THE Naval Consulting Board declines to recognise the standardisation meeting. Secretary Robbins, of the Naval Consulting Board, has written the Aeronautical Society that the meeting held December 31, at which representatives of various manufacturers were present, was not a meeting of the Naval Consulting Board or any committee thereof, but that it was purely a meeting called by the newly-formed American Society of Aeronautic Engineers, whose representative on the Naval Consulting Board, Henry A. W. Wood, recently resigned from the latter body, and that those members of the Consulting Board who were present were there merely as invited guests. Mr. Robbins stated this in denial of newspaper reports to the effect that it was a meeting of the Naval Consulting Board with manufacturers.

AEROPLANES IN THE DUTCH INDIES

Two American aeroplanes, purchased by the Dutch Indian Government at Los Angeles, arrived at Batavia the latter part of October, and a number of successful trial flights have taken place within the past few weeks, when an elevation of 3,000 ft. has been reached. It is reported that should the two machines be found satisfactory, others will be purchased from the United States.

THOMAS NEWS

Arrangements have been made with Mr. C. Ray Benedict to operate a branch of the Thomas School at St. Augustine, Fla., for a period of four months, beginning January 15, 1916. The assistance of another well-known aviator, Mr. Earle Dougherty, has been secured, and with this combination and the ideal weather conditions of the South, the progress of the students will be very rapid.

Among the number of students at present enrolled for training at St. Augustine are:—W. G. Peck, G. W. Peck, Alfred D. Pelton, Allen Wilson, of Montreal; R. M. Kierstead, of Toronto; J. D. Probst, of Englewood, N. J.; P. N. Montague, of Winston-Salem, N.C.; and Theodore Kruiff, of New York City.

St. Augustine is a city with many interesting points, and it offers a student an ideal place for training. It is doubtful if there is any other training school in the country where the art of flying can be acquired under such happy conditions. At every turn is an historic building, street, or relic of some kind.

Though the glamour of romance still clings to St. Augustine, the city is modern in all that tends to make life pleasant. Accommodations have been secured for the students near the training ground for \$5 per week, which includes room and board. Every class of accommodation can be found in this city, and a student can suit his own purse.

The United States Naval Aeronautical Station at Pensacola will be an added attraction for students who are taking training for military service. Almost every day the officers flying the machines are making long trips across country, out to sea, travelling by compass.

The report that Secretary Daniels will submit to Congress a plan for the creation of an Aviation Corps for the Navy by appointing aviators from civil life, without requiring them to pass through the Naval Academy, has resulted in many inquiries regarding the Thomas School and the method of instruction.

The class for the spring term, which begins in April, is now forming for the school located in Ithaca, and several applications have been received. The school will open there with about six machines, three instructors, with not over ten men to a machine.

NEW CORPORATIONS

MILITARY AVIATION CORPORATION, Buffalo, N.Y.—Capital \$25,000. Directors: Herbert A. Meldrum, John M. Satterfield, George P. Urban, all of Buffalo.

CURTISS AEROPLANE AND MOTOR CO., Buffalo, N.J.—\$6,750,000. Directors: Glenn H. Curtiss, Monroe Wheeler, Kenneth B. McDonald, and Harry C. Genung, of Buffalo; G. Ray Hall, of Hammondsport; and James Imbrie, C. Horace Connor, Murray W. Dodge, George Q. Palmer, and Harmon S. Graves, of New York. Monroe Wheeler, attorney and ex-judge, has been in the company from the earliest beginning, as has Genung and Hall, in Hammondsport. Connor is president and director of the Sperry Gyroscope Co. Murray W. Dodge, banker, is a director of several gas and electric companies. Palmer is president and director of the Alberger Pump and Condenser Co., and director or officer in a machinery company, an iron works and a gas company. Graves is a director of the Hamilton Bank Note Co. and the John Pierce Co.

AIRCRAFT IN ACTION

OFFICIAL INFORMATION

ENGLAND

February 7—Zeppelin Raid—Official Denial—Admiralty announcement: "In the German Wireless message to-day (February 7), the *Kölnische Zeitung* reports that from the Dutch frontier it has received information that on the occasion of the recent air raid to this country His Majesty's ship *Caroline* was struck by a bomb, in the Humber, and sunk, with great loss of life. Neither His Majesty's ship *Caroline* nor any other of His Majesty's ships, nor any merchant ship, large or small, was struck by a bomb, in the Humber, nor in any other port."

(See German Report)

February 9—Two Seaplanes over Kent—War Office Statement: "At 3.30 p.m. to-day (February 9) two German seaplanes were reported approaching the coast of Kent. A few minutes later these two seaplanes dropped three bombs in a field on the outskirts of Ramsgate, and four bombs dropped near a school at Broadstairs. Three of the latter exploded. No casualties are reported. No damage was caused other than to glass."

LATER

"It has now been ascertained that as a result of the hostile seaplane raid this afternoon, the following were injured: Two women; one child. A number of naval and military aeroplanes and seaplanes ascended to attack the raiders, who, however, retreated at once, and no engagement is reported."

February 9—Poperinghe Air Raid—War Office Statement: "With reference to the Berlin Main Headquarters report, dated February 8, 1916, to the effect that a German aeroplane squadron attacked Poperinghe railway buildings and camp, Sir Douglas Haig reports that a hostile aeroplane dropped four bombs near Poperinghe Station, but that no damage was done."

February 10—Details of Kent Raid—War Office Statement: "The following further information with regard to the air raid on February 9 has been received: The first raider appears to have selected as his target a tramway-car full of women and children, and the first bomb fell on the road close behind the car and exploded without any damage. The driver pulled up immediately and the passengers alighted. There was no panic, although the raider could be plainly seen circling round at a great height, and three more bombs were dropped in an adjoining field. The second raider made his attack on a large girls' school, and one bomb fell through the roof and exploded in an upper storey, doing some material damage. Portions of the ceiling fell into the room below, where a class of small children was being held, and one little girl was slightly cut on the foot and a maid slightly injured. Three other bombs fell in the school grounds, where two of them exploded without damage. The third failed to explode. Two other bombs were dropped on outlying parts of the town, causing slight material damage and a woman some cuts on the cheek. Within a few minutes of the sighting of the hostile aircraft, naval and military aeroplanes went up in pursuit, but were unable to overtake them owing to the precipitate nature of their flight.

[We submit that it is surely childish on the part of the authorities to continue to ascribe to the Huns efforts to destroy girls' schools and trams laden with women and children. As every aviator knows, a tram is not exactly a good target when you are flying at 10,000 feet. For goodness' sake let us abandon these puerile subterfuges and calmly recognise the fact that the Huns attempted to damage an English town, and, happily for us, failed in their intent.—ED.]

February 10—Raid on German Huts—Eighteen aeroplanes carried out a successful bombing raid yesterday (February 9) on enemy huts at Terhand. Several huts were damaged, and a steam lorry was hit. All our machines returned safely. (Terhand is about 8 miles east of Ypres.)

February 12—The German Air Attack—The facts of the German aeroplane attack described in the German wireless of February 8 are as follows:—

Eleven hostile machines appeared. One machine dropped three bombs about six miles behind our front line. It was driven down by two of our machines crossing the line at 500 feet. The remainder did not face our patrols, nor did they cross the line.

February 13—Aerial Activity—There has been considerable aerial activity by both sides about Ypres.

DARDANELLES

February 6—British Aeroplane Brought Down—Turkish Official: "On February 4 a Turkish battle aeroplane, piloted by Lieutenant Kronhais, pursued a British biplane. The latter was shot down between Imbros and Gaba Tepe and fell into the sea."

ITALY

February 7—Enemy Aircraft Active—Along the whole Isonzo front more intense artillery and aircraft activity on the part of the enemy is reported. Our artillery effectively replied and compelled the hostile aeroplanes to keep at a great height. In the Zagora sector (middle Isonzo) one of our aviators daringly attacked two hostile machines, forcing them to take flight by the fire of its machine-gun.

February 8—Bombs in the Sugana Valley—Enemy aircraft dropped a number of bombs on Borgo and Castel Telvana, in the Sugana Valley. Only very slight damage was caused.

RUSSIA

February 7—Huns Use Russian Signs on Aircraft—There is no doubt, from the reports received from our troops, that the Germans are using our distinctive signs on their aircraft.

February 8—Bombs on Steamer—A squadron of our hydroplanes attacked with bombs a large steamer anchored at the jetty at Zungaldak.

AUSTRIA

February 9—Bombs on Italian Steamers—Recently our aviators repeatedly bombarded with success the camp near Durazzo and Italian steamers lying in the harbour.

February 13—Raid on Italian Coast—Yesterday afternoon (February 12) a seaplane squadron destroyed two warehouses at Ravenna, and sulphur and sugar factories were seriously damaged. Some outbreaks of fire were observed. Our seaplanes were violently bombarded by anti-aircraft guns at Goreini. A second squadron hit the pumping stations at Godigore Cavanelle with several heavy bombs. All our seaplanes returned safely.

GERMANY

February 7—Russian Aeroplane Captured—South-west of Widzy a Russian aeroplane, the pilot of which missed his way, fell into our hands undamaged.

February 8—Air Squadron over British Lines—A German aeroplane squadron attacked the railway buildings at Poperinghe and the English camp between Poperinghe and Dixmude. After frequent fights with the enemy aeroplanes which ascended for defence, our squadron returned without loss.

(See English Report)

February 9—Hostile Aeroplane in Flames—Near Bois le Prêtre our infantry shot down a hostile aeroplane, which fell to the ground in flames. The two occupants were killed.

February 11—Bombs on Ramsgate Barracks—During the afternoon of the 9th inst. some of our naval aeroplanes dropped a number of bombs on the port and manufacturing establishments, as well as the barracks at Ramsgate, to the south of the mouth of the Thames.

Another version of the above message, described as an official communiqué, issued by the German Naval Staff, and dated "Amsterdam, February 10—Delayed," says that the aeroplanes dropped "a large number of bombs on the harbour works, factories, and barracks at Ramsgate."

(See English Official)

February 13—Ineffective Attack on Ghistelles—Our air squadrons heavily bombarded the enemy communications and railway buildings around La Panne (on the Belgian coast) and Poperinghe. An attack by enemy aviators on Ghistelles, south of Ostende, caused no damage.

FROM OTHER SOURCES

ENGLAND

February 7—Aircraft Insurance in Salonika—Since the Zeppelin raid, several British insurance companies have telegraphed to their agents in Salonika to accept insurances on goods against all war risks. The agents have effected insurances in two days for over £200,000.

February 9—The Seaplane Raid on Kent—At 3.30 this afternoon (February 9) two German aeroplanes arrived over the town from the sea and dropped three bombs on the outskirts of the town about 200 yards from the cliff between Ramsgate and Broadstairs. Nearly all the bombs fell in a field, and no damage was done, though some windows of a private house about 200 yards away were smashed. One bomb did not explode, and was taken away by the coastguard. The aeroplanes appeared at a great height, and flew very slowly. They barely reached the coast when the bombs began to drop. At Broadstairs four more bombs were dropped, also in quick succession, and fell in the grounds of a girls' school. Most of these bombs exploded before they reached the ground. Another bomb fell into the garden of a private house. A great number of people assembled in the vicinity where the bombs were dropped at Ramsgate. One dropped near the tramway lines. The German aeroplanes were only over the town for a few minutes, and then disappeared out to sea. Both the German machines were very light in colour. The sun was shining brightly, and it was difficult to pick them out in the clouds.

February 10—British Aviators Rescued—A report from Stockholm states: "The captain of the Gothenburg steamer *Olof Wijk* reports that recently he saved two British aviators. When off the Dutch coast a hydroplane, on which the French colours were painted, was sighted from the steamer. Two men, who were in a somewhat exhausted state, were on board, and on being asked if they wished to be picked up they replied in the affirmative, and were accordingly transferred to the steamer. The hydroplane was taken in tow, but owing to the darkness the steamer anchored, and during a gale the next morning the machine broke adrift, and was lost in the heavy sea. The aviators were subsequently landed at Dover."

EAST AFRICA

February 12—British Aircraft Activity—Reuter's Agency states that according to intelligence from East Africa up to January 15 there were a number of successful skirmishes with enemy. On January 7 British aeroplanes successfully attacked two hostile camps near Voi, occasioning much damage.

FRANCE

February 5—French Pilot Killed—A pupil belonging to the military flying school of Chartres, while flying for his military ticket over the circuit Chartres-Buc-Orléans, was fatally injured while landing at Buc.

February 8—M. René Besnard Resigns—M. René Besnard, Under-Secretary for Military Aviation, resigned as a result of incidents which occurred during the meeting of the Army Committee of the Senate, called together to consider the defence of Paris against air raids. In his letters of resignation M. Besnard stated: "Yesterday, after the meeting of the Army Committee which I attended, together with the Minister for War, it became abundantly clear to me that it was intended to invest the Under-Secretary with responsibilities which are wholly beyond his province. Only the Minister for War, being in control of all branches of military administration and command, is capable of holding such a position."

The Government accepted M. Besnard's resignation with regret, and decided to discontinue the position he filled, but to place the air service under the direct authority of the Minister for War, who was to appoint a director. Accordingly, on February 9, Colonel Regnier, of the artillery, Director of the Central Military Explosives School, was appointed Director of Military Aeronautics at the Ministry of War.

The post of Under-Secretary for Military Aeronautics was created, and M. Besnard appointed to it on September 14, during M. Millerand's tenure of the war portfolio.

February 13—Zeppelin Turns Back—A warning that a Zeppelin had been sighted was given in Rouen at 8.50 on February 12, and was withdrawn at 10.40. Similar steps were taken at Havre. It is assumed that the Zeppelin turned back.

ITALY

February 8—Protest against Air Raids—The *Osservatore Romano*, the official organ of the Vatican, published a strongly worded article protesting against the bombardment from the air of open towns and undefended territory.

February 9—Enemy Aeroplane Driven Off—On the afternoon of February 8, one of our destroyers, escorting an Allied cruiser, having sighted an enemy aeroplane and a destroyer, pursued and fired on the latter, driving it under the Cattaro forts, which opened against the Italian vessel an intense but fruitless artillery fire.

(See Austrian official)

February 13—Air Raid on Italian Coast—Yesterday (February 12) enemy aeroplanes flew over Codigoro, in the province of Ferrara, over Boterighe, in the province of Rovigo, and over Ravenna. Bombs were dropped and caused some casualties among the civilian population, 15 persons being killed and a number wounded. Among the killed were several women and children. At Codigoro and Boterighe slight material damage is reported, but at Ravenna the civil hospital, which is a Red Cross station, was struck and damaged, as well as the Basilica of Sant' Apollinare, a portion of the portico of which was destroyed.

(See Austrian official)

RUSSIA

February 8—Air Raid on Turkish Port—The following details of the air raid on Zunguldak are communicated from an authoritative source. The Russian hydroplanes on February 6 dropped bombs upon the most important Turkish land establishments and constructions for hauling and loading coal, as well as upon a large enemy steamer lying near the jetty. The bombardment by the aircraft appeared to cause considerable damage, and fires were seen to break out both on shore and on numerous small wooden ships lying behind the quay. Some bombs were also observed to strike the steamer, which apparently suffered extensively. Despite an intense fire from the shore, all the airmen returned safe. While the hydroplanes were rising from the water the Russian auxiliary cruiser was attacked by an enemy submarine, which fired a torpedo from a short distance. The cruiser, however, succeeded in evading it. The submarine was fired upon by the cruiser, and disappeared, not to be seen again.

(See Russian official)

February 11—German Aircraft Active—German aircraft have been very active on the northern front. Zeppelins have again appeared over Dvinsk and have made unsuccessful attempts to reach Minsk, and German aeroplanes are industriously scouting.

BALKANS

February 1—Airship Attack on Salonika—An air raid on Salonika took place at three this morning (February 1). Sixteen bombs fell on the town and harbour, killing three Greek, one French, and two British soldiers and four Greek civilians, and wounding about twenty Greek and Jewish civilians. Several houses and shops and one mosque were destroyed, and a large depot, the property of the Banque de Salonique, was set on fire and burned to the ground.

A Reuter message from Salonika states that the airship was a Zeppelin and that the raid took place on Monday night (January 31). No damage of military importance was done, but a Greek warehouse full of sugar, coffee, and oil was completely destroyed.

(See German Report)

February 1—German Aeroplane Brought Down—A German aeroplane was brought down to-day by the Allies at Topsisin. The two aviators were taken prisoners and sent to Salonika.

February 1—Austrian Bombs on Durazzo—According to telegrams from Durazzo, Austrian biplanes bombarded the town on January 25, while the Serbian Crown Prince was there. One of the bombs is said to have destroyed a house in which were lodged a number of Serbian officers, some 20 of whom, it is declared, were killed. The town was considerably damaged. The aviators threw down proclamations inviting the Serbians to follow the example of the Montenegrins and surrender.

February 1—The Salonika Air Raid—The warehouse set on fire by the German air raid at Salonika this morning (February 1) belonged to the Banque de Salonique, the whole block being burned down despite the efforts of the fire brigade and their voluntary helpers. The death-roll is now found to be fourteen, all Greeks, including two soldiers, and fifteen wounded, including a British and a French soldier. The warships in the harbour opened a vigorous fire on the raiders.

February 1—German Machine Brought Down—A German aeroplane set out this morning (February 1) doubtless with the intention of coming to see what Salonika looked like after its experience of a Zeppelin raid. Before it had crossed the Vardar, however, it came under the fire of the French anti-aircraft guns, and was hit by a shell and brought down. The two German officers in it are at the time of telegraphing on their way to Salonika as prisoners of the French.

February 1—Austrian Air Station at Dulcigno—It is reported from Durazzo that the Austrians have installed a seaplane base at Dulcigno, whence machines continuously observe the retreat of the Serbo-Montenegrin army.

February 2—Zeppelin Beaten Off at Salonika—The *Hestia* learns from Salonika that a Zeppelin has attempted to carry out a second raid on the town. It is reported to have come from the direction of the Chalcidice Peninsula. On its approach it came under the fire of the British batteries, which compelled it to retire.

February 2—French Aerial Activity—French aeroplanes trouble the Bulgars a good deal. One day while one of their anti-aircraft guns was firing at one aeroplane another aviator, coming up, dropped a bomb on it so accurately that of seven men serving the gun six were killed and the survivor wounded. Thirty were killed by an aeroplane which dropped a bomb as the men were coming out of church, and among them was a German officer.

February 2—The Captured German Aeroplane—The German aeroplane captured yesterday (February 1) at Topsisin was brought into Salonika this afternoon (February 2) and deposited in front of the Headquarters of the French Staff, where crowds of sightseers surround it. It is a huge machine of the Albatros type. It was not, as was reported yesterday, brought down by artillery fire, but by a French aeroplane bullet which smashed its radiator. The two successful aviators were publicly thanked and decorated by General Sarraill to-day.

The loss of Greek lives and the damage to Greek property, estimated at about £250,000, inflicted by the Zeppelin have provoked an outburst of indignation in the local Press. Sedulous efforts are being made by German propagandists here to persuade the ignorant lower classes of the population that all the injuries to life and property in yesterday's Zeppelin raid were caused by the guns of the fleet. It is, however, officially declared to-day that not a single shot was fired by the ships, all the explosions heard in the town being those of Zeppelin bombs, which are now known to have been 25 in number.

Fourteen French aeroplanes yesterday (February 1) flew over the Bulgarian town of Petritz and threw over 180 bombs on the enemy's positions, causing considerable damage to their camps.

February 3—The Air Raid on Salonika—Since reports are being circulated by German agents, especially among the natives of Salonika, who suffered by the Zeppelin bombs on Tuesday morning (February 1), that most of the damage was caused not by the bombs but by shells fired at the airship by the Fleet, it may be stated that none of the ships here fired a single round at the Zeppelin. For one thing, it offered a very poor, intermittent mark; for another, the Fleet desired to avoid causing any such casualties as are now falsely attributed to them.

February 3—Two Zeppelins on Greco-Bulgarian Frontier—A telegram from Salonika states that at midnight on Wednesday (February 2) two Zeppelins were reported to be on the Greco-Bulgarian frontier. They did not approach the town.

February 4—Zeppelins at Salonika—The Zeppelin attack on Salonika resulted in the slaying of numerous innocent people and in damaging private property. Aerial combats are frequent and lively among the belligerents. I have it from a good source that the French aeroplanes which attacked Petritz wrought great havoc among the Bulgarian encampments, killing many soldiers and causing a number of fires. The other day the British batteries on the Chalcidice Peninsula shelled a Zeppelin, which quickly turned tail and flew away. Several German machines which sought to attack Salonika were chased by French aeroplanes. A Taube which a French machine brought down at Gida was taken yesterday to the French aerodrome, where it will be repaired. Two German officers who were captured with the Taube have been placed on board a warship.

February 5—470 Bulgarians Killed—"The seventeen French aeroplanes which made a raid on Petritz in the Strumnitza Valley on February 1 remained over the Bulgarian town for twenty minutes, and dropped 200 bombs. According to a Bulgarian *communiqué* 470 men were killed in the Bulgarian camps, and the total of killed and wounded was about a thousand. In spite of a heavy fire from the enemy all the aeroplanes got back safely. A regular panic reigned in Petritz, where the military works were badly damaged."

BALKANS

February 5—Two French Aviators Decorated—The two French aviators who on February 3 brought down a Hun aeroplane near Topsisin were decorated with the military medal in the public square of Salonika in the presence of a huge crowd.

February 5—Damage to Salonika—The committee formed to assess the damage caused to the town through the recent airship raid has presented a long report to the Prime Minister demanding that an indemnity should be exacted from the German Government.

February 5—Roumanian Aeroplanes over Bulgaria—A telegram from Berne states that the first Roumanian aerial manoeuvres on a large scale took place recently, starting from Bucharest. One squadron, making for the Dobrudja lost its way over Bulgarian territory, and was fired at. The Sofia government has protested at Bucharest.

February 6—French Reconnaissances—An Athens message states that French aviators report that the Germans and Austrians are feverishly repairing the road from Uskub to Ghevgheli, and that important concentrations of troops are continually seen along the Greek frontier.

February 9—Air Raid on Smyrna—Information has been received from Mytilene that a squadron of French aeroplanes bombed Smyrna yesterday (February 8). The damage done is not stated.

SWITZERLAND

February 7—Italian Aviator Released—The Swiss military authorities have decided to release the Italian aviator who recently descended on Swiss territory, on the ground that he was not engaged in any operation of war, being without the equipment necessary for making even a reconnaissance.

(Reported in our issue of February 9)

February 7—Gilbert's Attempted Escape—Both Gilbert and Pary, his companion, have been brought back to Zurich, where they are now interned separately. They were questioned, but refused to give any answer.

February 8—Prison for Pary—The interned French aviator Pary, who attempted to escape from Switzerland with the aviator Gilbert, has been sentenced to twenty days' imprisonment.

HOLLAND

February 11—Zeppelin over Dutch Territory—A message from Nes, on Ameland, says that a Zeppelin passed to the north of Ameland this morning (February 11) flying in a westerly direction. The *Het Volk* says that at 8 o'clock last night (February 10) a Zeppelin was observed over Tilburg flying westwards. The *Handelsblad* learns from Vlieland that a Zeppelin passed there to-day (February 11) travelling north.

The *Telegraaf* reports from the frontier that three Zeppelins were yesterday (February 10) flying over Belgium in a south-westerly direction.

February 12—German Aeroplane over Denmark—This afternoon (February 12) between 2 and 3.15 a German aeroplane was seen flying near Copenhagen. The Danish Government having substantiated the fact that the aeroplane had been over Danish territory has through the Danish Minister at Berlin sent remonstrances to the German Government. The *Berlinske Tidende* says that the machine circled twice over the city at a height of 3,000 ft., disappearing over the harbour and navy yard.

February 13—L 20 Driven Back—Off Blaavand, near Esbjerg (west coast of Denmark), the Zeppelin L 20 (February 13) tried to steer southwards, but was unable to do so owing to the strong wind. She was driven back over the North Sea. An eye-witness states that the airship's engines were working very irregularly.

February 13—German Seaplane over Copenhagen—Although German naval aviators stationed in the Sound have, it is understood, orders not to fly over neutral territory, a German seaplane yesterday (February 12), the weather being suitable for observation, flew over Copenhagen at a height of 3,000 ft., following from Amager the line of the inner forts. A Danish officer immediately went up in a swift monoplane, and the German turned eastwards over the Sound. The German afterwards returned, flying from north to south over the city, passing the outer forts, and finally turned towards Køge-Bugt.

GERMANY

January 30—Zeppelins in the Baltic—According to news received from Malmö, a Zeppelin with its searchlights full on flew on Friday evening (January 28) over the island of Gothland in the Baltic. Other Zeppelins have been seen coming from the direction of Scotland, and passing over neutral territory.

February 2—Return of the Raiders—One at least of the raiding Zeppelins which yesterday (January 31) paid a visit to England followed what is apparently the usual course of returning home over Dutch territory. Early this morning (February 1), at about one o'clock, unmistakable noise of airships' motors was distinctly heard over Amsterdam, but owing to mist it was impossible to see the vessel. The Zeppelin came apparently from north-west and passed east. Another raider came from the direction of Helder, North Holland, this morning (February 1) and passed close along the coast of Vlieland, and eventually disappeared over Terschelling, going in a north-eastern direction.

[This report may be read with advantage in connection with the loss of L 19, which, as stated elsewhere, was certainly not due to Dutch gun-fire.—ED.]

February 2—Raid on England—On the night of January 31 one of our naval airship squadrons dropped large quantities of explosives and incendiary bombs on the docks, harbour, and factories in and near Liverpool and Birkenhead, on iron foundries and smelting furnaces, on Manchester factories, on smelting furnaces at Nottingham and Sheffield, and the great industrial works on the Humber and near Great Yarmouth. Everywhere marked effects were observed in the gigantic explosions and serious conflagrations. On the Humber a battery was also silenced. Our airships were heavily fired on from all directions, but were not hit and safely returned.

* * It may be added as a note of some interest that the official German wireless report of the raid was sent out from Berlin on Tuesday in English for the benefit of the American newspapers. This Anglo-German version is as follows:—

"The German Admiralty reports to-day that during the night from January 31 to February 1 a German airship squadron dropped a large number of brisance and incendiary bombs on and near Liverpool and Birkenhead Docks, the harbour and the factories. Also on Manchester, and that bombs were also dropped on blast furnaces at Nottingham and Sheffield, and also on a number of industrial establishments on the Humber and near Great Yarmouth.

"At all places the effect was heavy and caused mighty explosions and violent fires. On the Humber one battery was silenced.

"The airships were heavily fired on at all places, but they were not hit, and all of them, in spite of the efforts made by the enemy, returned in safety."

(See English Report)

February 2—"L 19" Hit by Dutch Fire—According to a telegram from Nes, in the island of Ameland, Zeppelin "L 19," while passing over Hollum, in the same island, yesterday (February 1) was shot at and hit by Dutch soldiers. The telegram adds that another airship passed over the island this morning (February 2).

February 2—"L 7" Befogged in Denmark—According to the journal *København*, Zeppelin "L 7" lost its way on Monday night (January 31) whilst flying over Danish territory owing to the dense fog. On reaching the Danish town of Vedsted it narrowly escaped coming into collision with the housetops. It managed to rise clear, however, and passed away in a southerly direction.

February 3—Hun Air Casualties—The Copenhagen correspondent of the *Daily Mail* reports that the last 23 Prussian casualty lists, Nos. 419 to 442, for January contain the names of 36,506 officers and men killed, wounded, or missing. This brings the total Prussian losses alone in the lists up to 2,337,096.

The lists include the names of 24 airmen killed and 11 wounded. Eighteen airmen are given as prisoners in the hands of the Allies and two interned in Holland through an involuntary landing.

[We commend these figures to the authors of the great Fokker myth.—ED.]

February 5—Lost L 19.—German Anger—According to a Berlin telegram, the attitude of the crew of the British trawler *King Stephen* towards the crew of the Zeppelin L 19 has caused a storm of indignation in the Berlin Press, which describes it as a worthy counterpart of the *Baralong* case. The *Lokalanzeiger*, which is especially angry, says:—"This fresh infamous action provides yet another of those disclosures which the present war has furnished us of the brutality of the British character, of which we 'barbarians' were so little aware that it took us a long time to realise its possibilities."

* * The wrecked Zeppelin L 19 was well known along the west coast of Denmark. She was formerly stationed at Hamburg and Tondern, and was frequently mentioned in newspaper reports from captains of North Sea vessels. For some time she patrolled the area around the Horn Reef and afterwards she relieved the wrecked L 18 at Tondern.

February 5—A Paris message states that "It is confirmed that the Zeppelin L 19 was brought down by Dutch guns at the moment when, with their usual contempt of neutrality, the airship passed over Dutch territory."

On Wednesday (February 2) the *Cologne Gazette* published an article headed "Paris, Manchester, Liverpool, Salonika," and began:—"German airships over Paris, over Manchester and Liverpool, and over Salonika, and all within three days. This is a measure of the enormous area which the world-war has assumed, and a brilliant picture of the immense military strength which Germany has displayed in this life-and-death struggle."

February 5—Bombs on Saint Omer—Two German aeroplanes flew over Hazebrouck (17 miles south-west of Ypres) on Saturday morning (February 5) towards 11 o'clock and were driven away very quickly by the Allies' aircraft and shrapnel. The Germans flew on to Saint Omer, where one machine dropped several bombs, killing two British soldiers and a civilian. This aeroplane is stated to have been brought down near Saint Omer.

February 7—Signals for Aerial Attacks—At Kiel the signal in case of an aerial attack is a series of short shrieks from steam sirens lasting two minutes. A series of long shrieks, also continuing two minutes, informs the people that the danger is over.

February 8—Germans Weary of Zeppelin Slaughter—The correspondent of the *Morning Post* writing from Stockholm, states: "A gentleman who arrived this morning (February 8) from Berlin informed me that although there was much rejoicing there over the last air raids on France and England, he noticed a distinct undertone of disappointment at the fact that no military success was achieved. He had spoken,

he said, with several sensible Germans, who made gestures conveying to him the idea that this horrible and purposeless slaughter had got on their nerves. He inferred that there were fears that retaliation would come sooner or later."

February 8—Fear of Reprisals—According to a message from Cologne, the military authorities there have issued a warning to the inhabitants to take shelter in cellars at the first signal, as an aerial attack by the Allies is feared in reprisal for the Zeppelin attacks.

February 8—Zeppelins in the North Sea—Scandinavian ships arriving from England state that they observed Zeppelins in the North Sea going westward on Friday and Saturday (February 4 and February 5) last. The steamship *Alle Jarl* observed four on Friday (February 4), when 142 miles from England. One stopped and circled round the *Alle Jarl*, twice descending so low as to risk touching the rigging of the vessel. Having ascertained that the steamer was a neutral craft the Zeppelin ascended and continued its voyage, travelling at high speed towards the west. All the Zeppelins carried shaded lights, unprotected lights, however, being visible in all their ears.

February 8—Remnants of a Zeppelin for Cologne—A report from the Hague states: "It has been observed that a goods train passed on the way to Cologne with the remnants of a destroyed Zeppelin airship, which is believed to have been wrecked in France."

February 9—Zeppelin near Swiss Frontier—A Zeppelin was reported flying over the Sundgau close to the Swiss frontier on Monday night (February 7). No raid, however, was attempted.

February 9—Zeppelin Wrecked—A report from the frontier states that a Zeppelin airship came down at Ligne, in the Belgian province of Hainault, and was destroyed as the result of attack by French aviators. The *Echo Belge* gives the following details: "During the night of January 29-30 a Zeppelin airship, which is supposed to have been the same which effected a raid over Paris, came down at Ligne, one mile from Ath, in the Hainault province. The airship at first came amongst trees standing on both sides of the station road, and subsequently crashed against a row of houses, of which two were completely demolished. The Zeppelin was entirely destroyed, and all the occupants appear to have been killed. The German authorities maintained great secrecy about the occurrence, this explaining the delay before details became known. The statement made yesterday that remnants of a wrecked Zeppelin had been conveyed to Cologne probably refers to the same airship."

[This report would seem to confirm, although only by circumstantial evidence, the Dutch report dated February 8 (printed on this page) that a Zeppelin has been destroyed in Northern France.—ED.]

AUSTRIA

February 3—Bombs on Italian Steamer—According to a telegram received in Vienna the North German Lloyd steamer *König Albert*, which was seized some time ago by the British and lent to the Italians, was sighted by Austro-Hungarian seaplanes near San Giovanni di Medua and captured by an Austro-Hungarian submarine. The vessel, which had 300 Serbian refugees on board, was towed into the Boeche di Cattaro by a destroyer.

Meeting of the French Aero Club—The Committee of the Aero Club of France met on February 5, and fixed March 30 as the date for the annual general meeting.

France and Air Reprisals—M. Blériot has written to M. Clémenceau, honorary president of the Ligue Aérienne Française, the following letter advocating the better use of technically trained men for the aerial defence of France:—

"I have been particularly affected," he writes, "by the insult of which Paris has been the victim. French aviation, which until the opening of hostilities was the first in the world, is undergoing, if not a crisis, at any rate a retarded development in its progress. The reason is very simple. The men who created the science of aviation have been eliminated from all technical committees, from the study of programmes, and in fact from the general direction. Let these men, who for the most part are aviators, engineers, and constructors, be given the real technical control in collaboration with two or three pilots selected from among the best of our fighting men, and in four months the lost time will be almost recovered. There is only just time. The few men necessary are Voisin, Caudron, Bréguet, Saulnier, Béchereau, Delage (Nieuport), and Farman. Let a higher committee be formed for the aerial defence of France. Their past record would be the guarantee for the future."

ZEPPELIN RAIDS

The Secretary of the War Office issues the following *communiqué*:

"During the recent air raid much inconvenience was caused to various military authorities by a number of telephone inquiries which were addressed to them from various sources asking for information as to the progress of events. The War Office desire to remind all who are disposed to adopt such means of obtaining information that when an air raid is in progress the whole of the military staffs concerned are fully occupied, and, moreover, the telephone lines must be free for the receipt of official reports, the issue of orders, and the necessary control of defensive arrangements, and that private inquiries greatly impede the collection of information."

RAIDS—POSTMASTER-GENERAL'S WARNING

The Postmaster-General has issued the following notice:—

"On the occasion of the recent air raid the transmission of official telephone messages of urgent importance was seriously interfered with at several places by the inconsiderate and unnecessary use of the telephone by private subscribers to call up the police and other public officials. The Postmaster-General earnestly appeals to the public to use the telephone as little as possible on such occasions, and on no account to call up the police or other public officials on unimportant or merely personal matters. If this warning is not regarded it may become necessary to curtail the facilities afforded to private persons on occasions of public emergency."

AIR DEFENCE OF BUCKINGHAM PALACE

For the protection of Buckingham Palace against hostile aircraft a sum of £1,987 1s. 6d. was expended early in the war, while £3,000 was allocated for the protection of the Parthenon frieze and Metopes and Assyrian bas-relief at the British Museum against hostile aircraft. This information is contained in a White Paper issued on February 12, containing the Appropriation Accounts for the year ended March 31 last.

ZEPPELINS AND NEUTRAL HOSPITALITY

The following letter, which recently appeared in the *Times*, is reproduced as bearing upon the controversy—purely academic but possibly of interest to future generations of lawyers—aroused by the case of *L 19*.

"You give publicity to-day to the contention of some German newspapers that a Zeppelin can claim the same hospitality on Dutch soil as may be claimed in Dutch ports by a German ship-of-war. Unless and until some reputable authority becomes sponsor for this specious nonsense, it does not call for serious criticism; but it may be worth while even now to cite against it a reputable German authority."

"Earlier in the war a German water-biplane had, in the course of a journey, such trouble with its engine as to be no longer able to fly, though still able to propel itself through the water. It so came, *via* neutral waters, to a neutral island; the neutral Government seized it and interned the crew. This conduct of the neutral Government was challenged as improper by one of the ablest and fairest of German writers on public law—Professor Wehberg, of Düsseldorf. He argued (*Deutsche Juristen Zeitung*, Vol. XX., 1915, p. 778), that no attention ought to have been paid to the fact that the seaplane was primarily designed for flight; it had lost the power of flight and entered neutral territory as a mere sea-vessel; being, then, a ship-of-war it ought said he, to have been accorded in neutral waters a sojourn of 24 hours or so much longer as might be needed for repairs and then be suffered to depart as it came—by water. But he incidentally wrote—and this is what is material here—that had the craft landed on neutral territory when flying in neutral air-space, the internment of the crew would have been proper, nay, necessary, for the rules of land-war apply, by analogy, to the air-space over neutral territory. Inasmuch as the *Deutsche Juristen Zeitung* is now practically inaccessible in this country, I had better transcribe the professor's exact words; they are:—

"Hat der Wasserflugzeug den neutralen Luftraum überflogen, und ist bei dieser Gelegenheit gelandet, so ist sicher eine Internierung statthaft, ja notwendig. Denn der Luftraum oberhalb des neutralen Territoriums ist ebenso geschützt wie das neutrale Gebiet selbst, und die Regeln des Landkriegsrechts müssen entsprechende Anwendung finden."

"You will see that this is a denial to Zeppelins of the privileges which the law of sea-warfare grants to men-of-war."

"J. PAWLEY BATE"

IMPERIAL AIRCRAFT FLOTILLA—AEROPLANES FROM MAURITIUS

A sum of over £5,000 has been raised within three weeks by public subscription in Mauritius for the presentation of aeroplanes to the War Office. The Crown Agents for the Colonies have been instructed to pay over the sum of £4,500 to meet the cost of two fighter aeroplanes with guns. The subscription is being continued.

DEMAND FOR WARNING OF AIR RAIDS

A Committee was appointed on February 9 to put before the Government the views which are held by the Midland authorities on the question of timely and effective warnings.

The conference, called by Mr. Chamberlain (Lord Mayor of Birmingham), was held in the Council House at Birmingham on February 9, and the attendance was representative of the counties of Warwick, Stafford, and Worcester, and the towns within the borders of those counties. Mr. Chamberlain presided.

The Lord Mayor stated that the meeting was the natural outcome of the recent air-raid. He deprecated anything in the nature of reprimand, and while expressing in strong terms his opinion of the inadequacy of the arrangements made to warn local authorities of the approach of aircraft, he considered it would be better to devise means for preventing the recurrence of recent events rather than to attempt to apportion the blame. The following resolution was moved:—

That this meeting, representing the local authorities of the Midlands, while welcoming the new Order from the Home Office ensuring uniformity of lighting restrictions throughout the area, records its conviction that no arrangement for the defence of the area will be adequate which does not provide an organised system for giving early warning of the presence of hostile aircraft in the country and information as to their subsequent movements inland. This meeting accordingly calls upon the military authorities at once to organise such a system and appoints the following gentlemen to act as a committee to interview the authorities and lay before them the methods which in the opinion of the meeting will best meet the requirements of the situation.

The Lord Mayor of Birmingham stated on February 10 that he hoped a deputation from the city would have an interview with Field-Marshal Lord French during the coming week.

Mr. Chamberlain wishes it to be made clear that he has not said it is desirable that the people should be warned at the earliest possible moment when enemy airships have crossed our coastline. That information, he considers, should only be given to Chief Constables. No public warning should be given until the airships are so near that it is absolutely necessary that the people should be warned for their own safety.

PROGRESS AT THE FLYING SCHOOLS

The Grahame-White School—Report of the progress of pupils at School for the week ended February 10: Civilian—Straights with instructor—Baragar, Box, Butler, Donville, Eichelbrenner, Hathaway, Holman, Kryn, Leigh, Parkinson, Sansys, Scheidt, Stapley, Williams, F. Walk and Williams S., Hodgkinson and Franck. Circuits with instructor—Butler, Verguill and Grasset. Eights alone—Mansell Howe. Brevet during week: Hallet.

The London and Provincial School—Instructors—W. T. Warren, M. G. Smiles, H. Sykes, C. M. Jacques and W. T. Warren, jun. Pupils doing rolling—Ledure, Houba, de Goussencourt, Vilain XIII, Aldous, Foley, Hay, Rimer, Scott, Pulford, Egelstaff, Starey. Pupils doing straights—Brown, Moore, Clement, Palethorpe and Vertongen. Pupil doing circuits and eights—C. J. W. Darwin.

The Hall School—The following pupils were out receiving practice last week: With H. F. Stevens—Evans, Redford, Ridley, Nicolle. With C. M. Hill—Lieut. Cooke, Ormerod, Thom, Dodds, Wooley, Arnsby, Cook, Smith, Collins. With J. Drew—Milburn, Chapman, Roberts, Neal, Rochford, Smith, jun., Bennett. With J. Drew (for A. Chave)—Worswick, Taylor, Le Grice, Halliday, Mahoney, Longton, Rand. Royal Aero Club certificates taken by Evans and test "A" passed by Redford. Machines in use, Hall tractors.

M. FOKKER DECORATED

M. Fokker, the Dutch inventor of the German battleplane and proprietor of the works manufacturing it, was decorated at the Schwerin aerodrome on February 7 with the Mecklenburg Cross for Merit in War by the reigning Grand Duke.

HONOURS FOR THE R.N.A.S.

The King has been pleased to give and grant unto Lieutenant-Commander (Acting Commander) Reginald Gregory, R.N., His Majesty's Royal licence and authority to wear the Insignia of Officer of the Order of Leopold, which Decoration has been conferred upon him by His Majesty the King of the Belgians in recognition of valuable services rendered by him.

ACCIDENT TO MR. F. P. RAYNHAM

Great regret will be felt at the news that Mr. F. P. Raynham is lying in a critical condition in a Weybridge hospital as a result of an accident at Brooklands about four o'clock on February 13. Mr. Raynham, who for some time past has been engaged in association with the Royal Flying Corps, had twice "looped the loop," and appeared thoroughly at home, when his machine suddenly fell from a height of about 2,000 feet. When picked up he was alive, but unconscious, and he was conveyed in a critical condition to a local hospital. It is the opinion of onlookers that the breaking of the tail of the aeroplane was the cause of the accident.

CASUALTIES

ROYAL NAVAL AIR SERVICE

SERIOUSLY INJURED

February 8

Graham, Flight Lieut. Charles W., R.N.

ROYAL FLYING CORPS

KILLED

Undated

Charles, 6679 Second Class Air Mechanic F.

WOUNDED

Undated

Sanday, Capt. W. D. S., R.F.C.
Thomasson, 2551 First Class Air Mechanic F.

PREVIOUSLY OFFICIALLY REPORTED MISSING, NOW UNOFFICIALLY REPORTED KILLED

February 3

Barton, Second Lieut. R., R.F.C.
Brooking, Second Lieut. W. A., R.F.A. and R.F.C.
Hayward, Lieut. C. O., 7th Lincoln Regt. and R.F.C.
Watts, Second Lieut. W., General List New Armies and R.F.C.
Wilkinson, Second Lieut. E. S., 1st London Regt. (T.F.) (Royal Fusiliers) and R.F.C.

(1. Wilkinson's death was reported in our issue of February 9)

PREVIOUSLY OFFICIALLY REPORTED MISSING, NOW UNOFFICIALLY REPORTED WOUNDED AND A PRISONER.

Wilson, Lieut. C. B., 10th (Prince of Wales's Own) R. Hussars and R.F.C.

PREVIOUSLY OFFICIALLY REPORTED MISSING, NOW UNOFFICIALLY REPORTED PRISONERS.

Adams, Second Lieut. F., General List and R.F.C.
McEwan, Second Lieut. J. G., R.F.C.

MISSING

February 6

Alexander, Second Lieut. E. H. E. J., King's Own (Yorkshire Light Infantry) and R.F.C.
Pearson, Second Lieut. L. J., R.E. and R.F.C.

NOW REPORTED KILLED

Undated

Head, Second Lieut. M., York and Lancaster Regt. and R.F.C.
Pitt, Second Lieut. G. L., R.F.C.

Second Lieutenant George Llewellyn Pitt, Royal Flying Corps, was previously reported missing. He was the fourth son of Mr. H. T. Pitt, of Rosslyn, Stamford Hill, N., and was 28 years of age. Lieutenant Pitt joined the York and Lancaster Regiment in December, 1914, and transferred to the Royal Flying Corps in July of last year. He was killed while making a reconnaissance on December 28, 1915.

DIED OF WOUNDS

Prestwich, Lieut. J., A.S.C., East Lancashire Divisional Train, (T.F.) and R.F.C.

NOW REPORTED DIED OF WOUNDS AS PRISONER OF WAR
Porter, Lieut. G. A., R.F.A. and R.F.C.

APPOINTMENTS

ROYAL NAVAL AIR SERVICE

Wing Commander:

R. C. S. Hunt, to *President*, additional, for duty in the Air Department: February 6.

Probationary Flight Sub-Lieutenants, for temporary service, and all appointed to the "President," additional, for R.N.A.S.:

R. A. Campbell, H. McL. Hill, and C. E. Pattison: January 10.

Temporary Sub-Lieutenant (R.N.V.R.), and appointed to the "President," additional, for R.N.A.S.:

J. A. Haton: February 7.

Temporary Sub-Lieutenant (R.N.V.R.):

S. Nixon, entered as Probationary Flight Sub-Lieutenant (temporary), and appointed to the *President*, additional, for R.N.A.S.: February 8.

Probationary Flight Sub-Lieutenant (temporary):

N. E. Woods, and appointed to the *President*, additional, for R.N.A.S.: January 25.

The following Probationary Flight Sub-Lieuts. have been confirmed in rank of Flight Sub-Lieut.:

R. Chambers: May 31.

G. H. Bittles: October 17.

The following Probationary Flight Sub-Lieuts. have been confirmed in rank of Flight Sub-Lieut. for temporary service:

H. A. Peck: July 23.

C. G. Knight: August 5.

B. C. H. Cross: August 7.

N. R. Davenport: August 21.

E. L. Pulling: August 21.

E. P. Hicks: August 23.

J. G. Hudson: August 29.

J. F. Horsey and M. Bartlett: August 30.

G. C. V. Hewson: September 24.

J. H. Vickers: October 1.

C. H. FitzHerbert and G. Thom: October 3.

H. W. Evens: October 6.

R. F. Maitland: October 20.

R. S. de Q. Quincy: October 24.

G. K. Blandy: October 31.

P. A. F. Belton: November 22

Acting Flight Lieut. A. W. Clemson has been confirmed in the rank of Flight Lieut.: April 23.

G. M. T. Rowse, promoted to Probationary Flight Sub-Lieut. (temporary), with seniority of February 10, and appointed to the *President*, additional, for R.N.A.S.

Temporary commissions as Sub-Lieuts (R.N.V.R.) have been granted to the following:

- A. B. Spencer, with seniority of January 24, and appointed to the *President*, additional, for R.N.A.S.
A. L. Howarth, with seniority of February 10, and appointed to the *President*, additional, for R.N.A.S., to date February 17.

ROYAL FLYING CORPS

Staff Capt.:

Lieut. A. G. R. Garrod, Leicestershire Regt., S.R., from a Flying Officer, vice Second Lieut. W. L. Birch, Prince of Wales's Own (West Yorkshire Regt.), T.F.: December 5, 1915.

The following appointments are made:—

Wing Commander:

Capt. (temporary Major) E. R. Ludlow-Hewitt, R. Irish Rifles, from a Squadron Commander, and to be Temporary Lieut.-Col. whilst so employed: February 1.

Wing Commanders, from Squadron Commanders, and to be Temporary Lieut.-Cols. whilst so employed:

Capt. (Temporary Major) A. C. H. MacLean, R. Scots; Major H. C. T. Dowding, R.A.; Capt. (Temporary Major) C. L. N. Newall, 2nd Gurkha Rifles, I.A.; Capt. (Temporary Major) P. L. W. Herbert, Sherwood Foresters; Brevet Major D. S. Lewis, D.S.O., R.E.: February 1.

Squadron Commanders:

Capt. H. D. Harvey-Kelly, D.S.O., R. Irish Rifles, from a Flight Commander, and to be Temporary Major whilst so employed: January 30.

Capt. G. C. R. Mumby, S.R., from an Equipment Officer, and to be Temporary Major whilst so employed: February 2.

Flight Commanders, from Flying Officers, and to be temporary Capt. whilst so employed:

Temporary Lieut. H. M. Sison, A.S.C., and Second Lieut. H. E. Van Goethem, S.R.: January 30.

Capt. R. G. Blomfield, Surrey Yeomanry (T.F.): February 3.

Capt. A. G. Moore, Manchester Regt., S.R., and Capt. Charles R. S. Bradley, 4th Cavalry, Indian Army: January 27.

Flight Commander:

Lieut. J. P. C. Cooper, S.R., from a Flying Officer, and to be Temporary Capt. whilst so employed: January 27.

Flying Officers:

Second Lieut. (Temporary Lieut.) W. B. Ellis, A.S.C., T.F.: January 8.

Temporary Second Lieut. E. T. Farrow, Middlesex Regt., and to be transferred to the General List: January 18.

Temporary Second Lieut. J. Callaghan, R. Munster Fusiliers, and to be transferred to the General List: January 25.

Second Lieut. P. R. Tankerville-Chamberlayne, 11th Hussars, S.R.; Second Lieut. A. W. Briggs, S.R.: January 26.

Lieut. G. H. Morton, 48th Canadian Infantry Bn.; Temporary Second Lieut. T. H. McDowell, R.A., and to be transferred to General List; Temporary Second Lieut. A. D. Pearce, Royal Warwickshire Regt., and to be transferred to General List; Second Lieut. F. G. Pinder, Special Reserve: January 27.

Temporary Second Lieut. H. A. Johnston, Middlesex Regt., and to be transferred to General List; Second Lieut. R. J. Lowcock, Sherwood Foresters; Second Lieut. C. B. Bond, Middlesex Regt., Special Reserve, and to be seconded: January 28.

Second Lieut. A. Ball, Sherwood Foresters (T.F.), and Second Lieut. A. T. Harris, Special Reserve: January 29.

Balloon Officers:

Capt. L. V. S. Blacker, Queen Victoria's Own Corps of Guides, I.A.: December 3.

Second Lieut. C. G. Jones, S.R.: January 28.

Central Flying School—Commandant:

Brevet Major (Temporary Lieut.-Col.) C. J. Burke, D.S.O., R. Irish Rifles, a Wing Commander, and to retain his temporary rank whilst so employed, vice Capt. (Temporary Lieut.-Col.) D. le G. Pitcher, 39th Central India Horse, I.A.: February 1.

Central Flying School—Instructor:

Capt. J. H. A. Landon, Essex Regt. (T.F.), a Flight Commander, Military Wing, vice Capt. J. L. Jackson, Connaught Rangers, Special Reserve: January 23.

Assistant Equipment Officers:

Second Lieut. (Special Reserve) J. Elgood: December 1.

Second Lieut. J. Brown: December 21.

Second Lieut. H. R. Spence: December 23.

Second Lieut. S. Turner: December 27.

Second Lieut. L. J. Stuart: December 29.

Second Lieut. H. J. Poole, S.R.: January 1.

Second Lieut. E. W. Bowen, S.R.: January 7.

Temporary Lieut. R. C. Lane, Middlesex Regt., and to be transferred to General List; Temporary Second Lieut. H. N. Nowell, attached Royal Horse Guards, and to be

transferred to General List; Second Lieut. D. G. Prentice, Worcestershire Regt., Special Reserve, and to be seconded; Second Lieut. G. A. Crane, Special Reserve; Second Lieut. H. Jameson, Special Reserve; Temporary Second Lieut. C. S. Kent, General List: January 29.

Directorate of Military Aeronautics, and to be Temporary Hon. Capt. whilst so employed:

J. S. Nicholson: October 18.

Temporary Second Lieut., for duty with the R.F.C.:

Corp. Harry G. Smart, from R.E., T.F.: November 30, 1915.

ROYAL FLYING CORPS—SPECIAL RESERVE

Capt. Hon. William F. F. Sempill (Master of Sempill) relinquishes his commission on appointment to the Royal Naval Air Service: January 1.

Second Lieuts. (on probation) confirmed in rank:

Alfred W. Briggs, H. Jameson, and A. T. Harris.

Second Lieuts. (on probation):

Arthur H. L. Beale: January 17.

Arthur E. Oxley: February 3.

J. T. Spittle.

C. G. Jones.

F. G. Pinder, G. A. Cranc, J. Elgood, J. Brown, H. R. Spence, S. Turner, L. J. Stuart: February 2.

F. Murphy: February 2.

Second Lieuts. to be Lieuts.:

H. V. C. de Crespigny, G. S. Peacock, L. W. F. Turner, B. C. McEwen, A. M. Low, G. E. W. Humphery, H. A. Cooper, C. W. Snook, E. W. Barrett, C. W. Willcox, E. Powell, W. H. Furlonger, I. O. Griffith, M. A. Shepstone, C. Hirtzel, J. T. Spittle: January 1.

Second Lieut. placed on Half-pay List on account of ill-health:

N. S. Roupell: February 28.

PATENT INFORMATION

This list is specially compiled for AERONAUTICS by Messrs. Rayner and Co., Registered Patent Agents, of 5, Chancery Lane, London, from whom all information relating to Patents, Designs, Trade Marks, etc., can be obtained gratuitously.

LATEST PATENT APPLICATIONS

- 1,333 A. A. Canton. Aircraft. 27/1/16.
1,324 G. H. Challenger. Aircraft. 27/1/16.
1,329 E. Holt. Flying machines. 27/1/16.
1,301 F. Newfield. Leather coat for aviators. 27/1/16.
1,112 S. E. Saunders. Aeroplanes. 24/1/16.

SPECIFICATIONS ACCEPTED

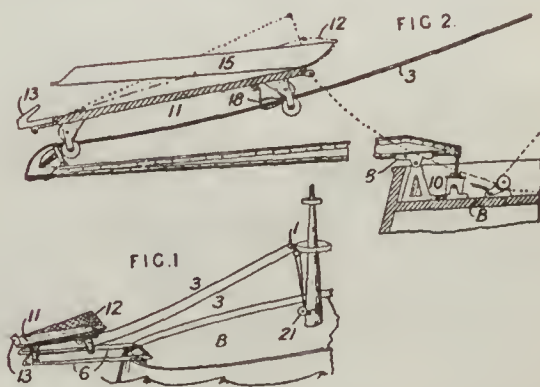
- 1,488 Vickers, Ltd., and Pratt. Swivelling gear for the propellers of airships.
5,862 Short. Valves for aerostats.

SPECIFICATIONS PUBLISHED THIS WEEK

- 2,103 Kamp. Airships or dirigible balloons.
2,233 Fairfax. Flying machines.

LATEST PUBLISHED ABSTRACTS

- 20,735 "Platforms and Launching-ways." J. M. Thorpe, 455, Haight Avenue, Alameda, California, U.S.A. In an alighting and launching apparatus for hydro-aeroplanes, a carriage 11 for receiving the floats 15 of the machine is adapted to travel on incline ropes 3 extending between a cross-beam 1 on the mast of the ship and the ends of pivoted arms 6 projecting beyond the side of the ship B. The arms 6 are controlled by an hydraulic cylinder 10 to



counteract the effect of the motion of the ship. For alighting the carriage 11 is provided with a net 12 and a rear guard 13 to receive the float, and with spring-pressed clocks 18 to prevent its backward movement. After the machine has come to rest, the ropes 3 are lowered on the deck by a winch 21.

Full copies of the specification can be obtained from Messrs. Rayner and Co. at the price of 1s.

THE L.C.C. AND AIR RAID INSURANCE

At the meeting of the London County Council on February 8 Mr. W. Reynolds asked the Vice-Chairman of the Finance Committee whether, as insurance against damage to property by hostile aircraft had now become necessary over a larger area of this country than before, and as the premium for such insurance on London property constituted a heavy burden on the people of the Metropolis, not only as individual property owners and tenants, but also collectively through their representative bodies such as the County Council, he would bring before the Finance Committee the question of approaching the Government with a view to the individual being relieved of the tax for this insurance, compensation to be made for all aerial damage done by the enemy out of the moneys belonging to the enemy now held in this country on his behalf. Mr. Buxton's reply was to the effect that on January 26 the Finance Committee reported on a request of the Committee on War Damage that the Council should join in a memorial to the Prime Minister urging the abandonment of the Government scheme for insurance against damage by aircraft, etc., and stated that they had decided to take no action. He promised to bring the second part of the question before the Finance Committee.

LEGAL NEWS

SENTENCE ON FLIGHT-LIEUT. OTTO THELEN

Sentence was promulgated on February 8 by the Military Court held at Philberds, Maidenhead, last week on Lieut. Otto Thelen, of the German Army Flying Corps, and Lieut. Hans Keilhack, of the German Navy. The sentence of the Court on each is nine months at the Military Detention Barracks, Chelmsford, whither they were conveyed in a motor-car by an armed escort.

(The charges against these officers were reported in our issue of February 9.)

LETTER-WRITING DANGERS

A music-hall artist named Ellen Frost, of Shaftesbury Avenue, London, was on February 7 remanded on bail on a charge preferred under the Defence of the Realm Act of communicating information which might be of use to the enemy. The proceedings arose out of a letter written by her to her agent, Mr. Montague, concerning the recent air raid. The defence was that there was no wrongful intent.

ALLEGED FLASHLIGHT SIGNALS

Proceedings were resumed in a Midland town on February 11. A solicitor now appeared for the Chief Constable of the county, and also the military authorities, and intimated that the latter had considered the case and decided that it was not a minor offence, and the accused must be tried either by Court-martial or at the Assizes, according to the decision of the authorities. The accused had, therefore, been handed over to the military authorities, and would not be brought into Court, and the jurisdiction of the magistrates ended.

THE INSTITUTION OF MECHANICAL ENGINEERS

The annual general meeting of the Institution will be held on Friday, February 18, at 6 p.m., at the Institution of Civil Engineers, Great George Street, Westminster. The annual report of the Council will be read. Mr. Henry Fowler will read a paper on "Chisels."

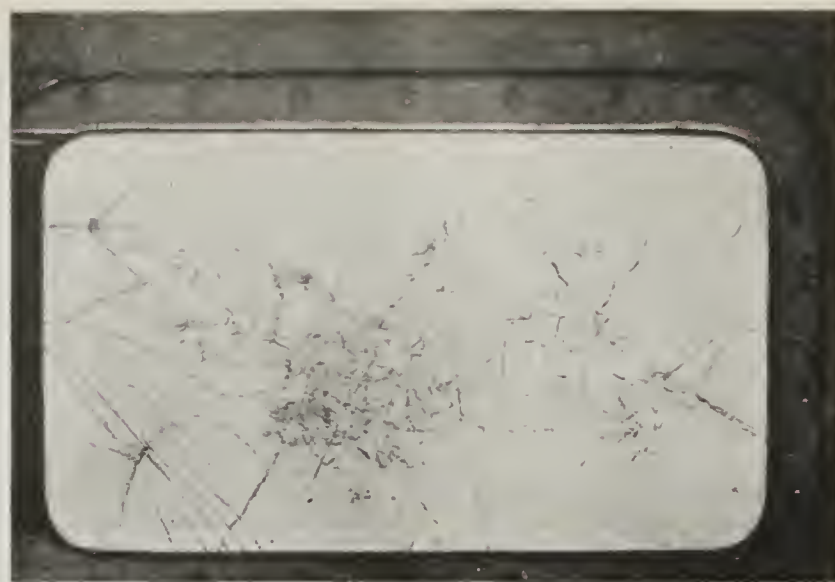
SOCIAL

A marriage is arranged, and will shortly take place, between Lieut. Alastair George Lionel Miller, Irish Guards, attached to Royal Flying Corps, only surviving son of Sir William F. Miller, Bart., and Lady Miller, of Glenlee, and 57, Ennismore Gardens, and Flora, youngest daughter of Mr. and Mrs. William Petersen, Cherkley Court, Leatherhead, Surrey.

A FRIEND IN NEED

The life-saving and eye-protecting qualities of Triplex glass are sufficiently well known to our readers. The two accompanying

of ordinary glass there can be little doubt but that serious bodily injuries would have been inflicted.



WILLS AND BEQUESTS

Lieut. Kenneth Watson Harvey, R.F.A., aged 24 years, 19th Anti-Aircraft Section, of Blackbrook Grove, Fareham, died from wounds, £6,516.

THE SUPPLY OF "SHELL" SPIRIT

The situation in regard to supplies of motor spirit to this country, and the special responsibility which falls upon us as the owners of "Shell" motor spirit, has prompted us to address our clients direct, and explain to them the situation as it is to-day.

About a month ago we instructed our agents to issue a circular inviting the co-operation of the public in the difficult situation which had arisen.

Of the motor spirit requirements of H.M. Forces we are supplying five times as much as the whole of our competitors put together; but, in spite of this great and constantly increasing strain upon our resources, we have determined to maintain unchanged the price at which we have been supplying motor spirit to the public. Owing to the increasing requirements of the Forces we cannot maintain the supply of the same large quantities to the public as we have been able to deliver in peace time, and it is for this reason that we have asked our clients to limit their requirements to a minimum, and to use every possible economy in the quantities consumed. If the public will co-operate with us in this respect we hope to be able to maintain reasonable supplies of "Shell" motor spirit for them, and to continue to supply it at the old price of 2s. 2d. per gallon unless some very unexpected development occurs.

Our supplies of "Shell" motor spirit at present available to the public after supplying the whole of the requirements of H.M. Forces represent about one-third of the supplies in peace time, and we are of opinion that, having regard to the large number of motorists now withdrawn from this country, if our clients will exercise the utmost possible economy of consumption, we may still be able to satisfy at any rate the major portion of their requirements. We prefer to do this at the old price of 2s. 2d. per gallon rather than to take advantage of the national necessity by raising the price.

We feel confident that in continuing to reserve for H.M. Forces sufficient quantities to enable them to receive ample supplies of the finest spirit obtainable, we shall be acting in a manner which commends itself to the very great majority of our clients, and we confidently rely upon their being willing to co-operate with us by economising consumption and thus limiting to the utmost possible extent imports, the increase of which, as is well known, is directly contrary to the national interests in the present circumstances.

It will be our constant endeavour to secure that garages shall receive at least one-third of the quantity of spirit which they have been accustomed to receive from us, and at the old price, which enables them to sell to consumers at:—

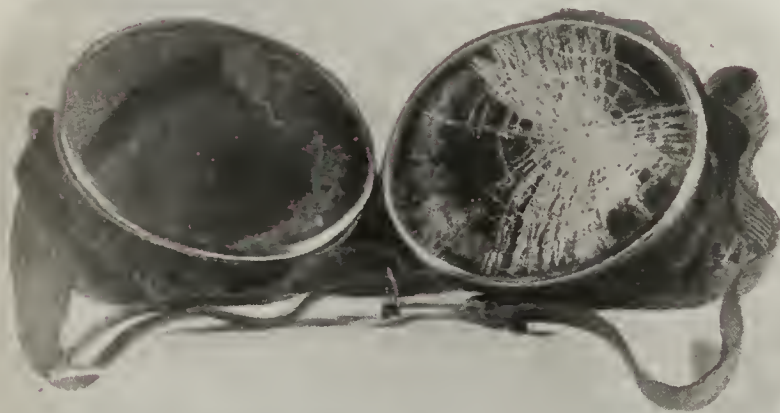
"Shell"	2s. 2d. per gallon.
"Shell II."	2s. 1d. "
and "Crown"	2s. 0d. "

THE ASIATIC PETROLEUM CO., LTD.

February 9, 1916.

PETROL PRICES

The prices now ruling for motor spirit practically all over England and Wales are as follows:—Shell, 2s. 2d.; Shell II. 2s. 1d.; Crown, 2s.; Red Line, 2s. 5d.; Red Line II., 2s. 4d.; Pratt's, 2s. 6d.; Pratt's II., 2s. 5d.; Taxibus, 2s. 4d.; Mex 2s. 4d.; Ensign, 2s. 3d. The price in Scotland is, generally speaking, a penny higher, and in Ireland it varies according to the district.



ing illustrations of the virtues of Triplex carry their own tale. Had either the screen or the pair of goggles depicted been made

AERONAUTICS

A WEEKLY JOURNAL DEVOTED TO THE TECHNIQUE OF AERONAUTICS

(FOUNDED 1907)

Edited by JOHN H. LEDEBOER, B.A., A.F.Ae.S.

VOL. X. No. 123 (NEW SERIES)

FEBRUARY 23, 1916

[Registered at the G.P.O.]
as a Newspaper

ONE PENNY

THE JIG-SAW PUZZLE

OUR besetting and cardinal sins in the conduct of the war have been twofold in their nature: lack of preparedness and indecision. No better illustration of these supreme delinquencies could be afforded than by our pre-war treatment of the Air Services and the vacillating policy—rather, let me term it, bluntly, lack of policy—of the Government and our responsible advisers and authorities in their employment ever since. Before proceeding, let one matter be made plain once and for all. Whatever legitimate criticism may be levelled against the conduct of the aerial war, whatever aspersions may be cast upon those ultimately responsible in this matter, not a vestige of blame can attach to the personnel of the Naval Air Service or of the Flying Corps, which, in both cases, has been incomparable. Rather the contrary: it is a matter for lasting astonishment that the Air Services have acquitted themselves so admirably well, handicapped as they have been throughout by the stubborn apathy of officialdom and its refusal to move.

One reservation must here be made. Our casualties in the air have lately been unduly heavy as measured by the standards set in the early days of the war, even though we may allow that our casualties, *proportionately to the numbers engaged*, show little, if any, increase. Assuming that, the increase in the casualty lists, personally and materially—the losses in aviators and machines—can only be explained on one of three grounds: inferiority of our material, inferiority of our personnel, or a sudden marvellously rapid increase of the German forces in both respects. The question of our material cannot be discussed here, save for the remark that, as a whole, it is certainly not superior to that of the Germans. That the Huns have suddenly evolved a super-aeroplane or a super-aviator we know to be untrue. Remains the question of our personnel. The members of the original R.N.A.S. and R.F.C. were undoubtedly, in point of training and personal qualities, streets ahead of the Huns; it is literally true, to quote that famous official despatch, that they established over the enemy a clear personal ascendancy. It would be idle to make the same assertion at the present time. And the reason is not far to seek. The fault lies in the system, or lack of system, by which they are trained. In many cases the moment a new Service pupil is trained to the pitch of being able to make straights, or even of obtaining his Aero Club certificate, he is despatched across country and drafted out to the front at the earliest opportunity. Now these young fellows are far from being trained pilots; for on active service personal gallantry cannot take the place of training. As already stated, the fault lies in the system. A uniform code and standard of instruction and training would at once solve the difficulty.

And now for the main thesis of this article. For the first time in our history we have had a full-dress debate in both

Houses of Parliament on the state of our Air Services and the Government's policy in regard to measures of aerial offence, defence, and organisation. Much was expected of that debate, and correspondingly meagre were its results. The Press heaved and laboured, but the Government brought forth a ridiculous mouse. One and all of us we hoped—maybe against hope—for some authoritative statement of radical reform, for some weighty pronouncement of a definite future policy. One and all of us we were once again disappointed—shall I say not unexpectedly?—for the upshot was—well, just a decorous parliamentary debate, with Government representatives unctuously oozing sedatives. As Toby, M.P., would have it: *Business done*—nothing. In fact, we are precisely where we were,

A cursory glance would stamp the report of the debate as tedious reading in the extreme; but on closer examination it is illuminating enough in parts. Columns of close print being somewhat repellant to the ordinary readers, it may be well to analyse the discussion. Let us take the House of Commons first. The debate took place on February 16, and was opened by Mr. Joynson-Hicks, who moved an amendment to the Address regretting the absence of any "proposals for placing the Air Services of the country on a firmer and stronger basis." Admirably worded as was the amendment, covering the whole ground in the broadest possible manner, the ensuing debate trailed off into inconsequences, and under the influence of Press fomentations centred mainly on the alleged defencelessness of these islands against Zeppelin attacks. Now, for years past we have insisted that aerial defence, in the strict interpretation of the term, is merely a minor incident in the whole vast new problem of our national aerial activity. As the *Times*—and we are glad of the most recent convert to our views—aptly summarised the matter last Monday:

"The danger is that Ministers and their apologists will always succeed, as they succeeded last week, in keeping the discussion on comparatively trivial issues. When will they realise that this vital question of our future air policy is very much larger than the accident of an occasional German raid?"

Not a single speaker in either House, unless it was Mr. Balfour on Wednesday or Lord Kitchener on the following day—both of whom laboured under the obvious disability of having to make good the delinquencies of another member of the Government—viewed the matter in this aspect.

What was the indictment levelled against the Government? From the welter of verbiage and of argument six main points may be extracted. First and foremost, inadequate means of defence against Zeppelin raids at home— aeroplanes, airships, and guns being equally defective and

inadequate in numbers. The absence of a strong offensive against the enemy on the part of our aeroplane squadrons. Lack of the necessary material, in the shape of long-range machines, for carrying such attacks into practice, and, further, a comparative shortage of aeroplanes on certain parts of our lines in France and Flanders. Inefficient organisation of the higher command of the R.F.C.: "men being made squadron-commanders with practically no experience of flying." Rivalry between the R.N.A.S. and the R.F.C. in the matter of obtaining material and supplies. Finally, lack of central control and co-ordination and the splitting up of responsibility.

There stands the indictment, apart from the usual political reviling. What, then, are the remedies suggested?—for a constructive policy should accompany all serious criticism. And here we find the true reason for the ineffectual nature of what should have been a historic debate; for the only remedy adumbrated, and then only in the vaguest terms—

But let us be just before all else. The Government had, after weighty deliberation, decided to reform the Air Services. The air defence of these islands is to be transferred from the Admiralty to the War Office, but only as far as the coast-line; beyond that the Admiralty again reigns supreme. This stupendous reform came into force on February 16—note the date. Moreover, the Army provides the aeroplanes required to work the home defence troops and the necessary flying stations; the Navy, on the other hand, provides the aircraft required to watch the coast and to organise the necessary flying stations.

Meantime Sir Percy Scott is shunted from the Admiralty to the War Office, Lord French is to command the Air Service at home, and the Home Office is entrusted with the responsibility for giving warning of approaching aircraft. If this extraordinary tessellation does not constitute a reshuffling of responsibilities, one can only say that the English language has lost all meaning.



THE 50 H.P. RUFFY-BAUMANN BIPLANE

apart from occasional vapourings regarding accelerated production and an increased supply of materials—was to place the control over the naval and military branches of the Air Services under central and undivided ægis. In regard to this matter no definite concrete proposals were made; speaker after speaker was content to indulge in generalities.

But if the attack was weak, good though was its case, what shall we say of the defence? It can only be described as lamentably ineffectual. Of a bold constructive policy there was not a sign. The Under-Secretary for War was the first apologist. That the air service was far from perfect he was willing to admit, but then, you see, the whole problem is still largely in an experimental stage (after eighteen months of war and half-a-dozen years of constant warning, which the politicians sleepily ignored!). The defence of every part of the country against aerial attack was impossible—so here we switch on to the Zeppelin business, an attractive and simple talking-point—so we must be content to protect really vulnerable points. Incidentally, are the great manufacturing districts of the Midlands a vulnerable point? The very possibility of a raid over this district, admits Mr. Tennant, "probably never crossed the honourable gentleman's mind. It certainly had not crossed mine." Ye gods and little fishes, let us be duly thankful for Mr. Tennant.

So much for reform. But stay. According to the official statement:

A Standing Joint Naval and Military Committee will be formed to co-ordinate questions of supply and design of material for the two air services.

Still, it is not correct to suggest that there has been no co-operation between the Army and the Navy on this subject! By the way, which Government department is to be responsible for this Joint Committee? Why, the Committee of Imperial Defence, of course; and there, for the present, our jig-saw puzzle lies completed.

With much that the critics said on this famous occasion one may cordially disagree, and more particularly with their tendency to take the recent Zeppelin scare as their sole text. But that the strictures they passed on the lack of organisation until now prevailing were in the main justified is sufficiently shown by the lameness of the answer they produced. If the debate as a whole revealed a total lack of a constructive policy, we are not disposed to enrol ourselves among the ranks of mere critics, but shall endeavour next week to sketch out the main outlines of a scheme of re-organisation which can be immediately carried into effect.

J. H. L.

THE LAY-OUT OF AN AIRCRAFT FACTORY

By GEORGE H. MANSFIELD

Author of "Small Factory Output and How to Speed It," and Proprietor of the Aircraft Supply Company

THE major points in the designing of an aircraft factory are considered in the following article, such points combining economy in working as well as construction, in addition to ample facilities for effectually carrying out contracts for the construction of aeroplanes.

In considering the lay-out of an aircraft factory much must necessarily depend upon the site chosen, although generally it will be possible to obtain a site either square or rectangular in shape, and on this assumption the design shown on the accompanying illustration has been prepared.

Up to the present time, owing to the fact that many manufacturers were not able, in the first instance, to make preparations for the facilities for manufacturing as they would have desired, the majority of the factories have had to be added to from time to time, and whereas, for instance, the whole factory may have been contained in a certain area, the necessary expansion has had the effect of removing some departments from one place to another to make room for others; it is not difficult to appreciate that had it been possible for some manufacturers to lay down a factory complete in itself, on the lines of the accompanying design, much trouble and delay could have been avoided, while, as a further effect of the expansion already referred to, in many cases it would even now be almost impossible to arrange departments to the best advantage without destroying the whole factory and reconstructing it on different lines. Therefore the points discussed in the following article may seem quite advantageous and pleasing to manufacturers in a position to carry out the ideas; but if this is not possible in respect of the whole scheme there will be points which may be utilised by certain re-arrangements. On the other hand, in cases where new factories may be in contemplation it is hoped that the whole scheme may be found of some considerable assistance in the lay-out.

There is no intention, in this article, to deal with the method of construction as applied to a factory, but merely with the arrangement of the different departments and consequently, after careful perusal of the accompanying illustration, the following points will serve to explain fully the reason for disposition of the various shops, offices, stores, etc.

It may be assumed that the entrance to the factory will be at the north-east corner as shown, while the entrances for the staff and goods would be on the east side. Commencing at the entrance gates, we have that to the offices and also the testing-yard outside the Erecting Department; with regard to the offices, they are only shown on the ground floor, as accommodation necessary for the administration will depend to a great extent upon the actual circumstances of the business generally, and there would always be ample room for further offices over the ground floor now shown.

Next we have the staff entrances and the passage which will divide the administration offices from the works, offices and departments, at the same time gaining facilities for the occupants of these offices to have easy access to the various departments in the works.

Commencing with the works' departments, we first of all have an office for the chief Government inspector, while the next room has been reserved for the installation of an electric copier and store-room for blue prints and drawings. Leading out of the chief inspector's office there is the Government Inspection Department, where metal parts would be laid out for inspection and which would usually be supplied by the Progress Department, thus enabling the necessary

records to be kept of parts going through and those rejected from time to time. On the other side of the passage we have the works' offices, provision being made for the chief engineer, superintendent of the Machine Shop, and the works' clerks, while next to the two latter a good space is reserved for the firm's Inspection Department; by this arrangement parts which have been inspected by the firm and passed can easily be taken to the Progress Department, and from there, as explained, to the Government inspectors, while when the parts are ready for use in the construction of machines, they can be taken along the passage to the Finished Store, shown at the back of the Drawing and Administration Offices. It is as well to mention here that wide passages are provided in order to facilitate the conveyance of parts and access generally to the various departments.

We now come to the departments of supply to the factory, namely, the Raw Material Store and Receiving and Despatch Department. All goods whatsoever would come through the Receiving and Despatch Department, and for the sake of economising space as much as possible, provision has been made for a testing machine in this department, although should it be considered more advantageous, there is, of course, no reason why this machine should not be placed in another department and the space utilised accordingly. The benefit, however, of having the testing machine in the Receiving and Despatch Department is that in the case of raw material, the same need not be removed until the necessary tests have been made and found to be satisfactory, and as an inspector would be continually occupied in gauging and examining raw material, it will invariably be advantageous to have the testing machine at hand, and not away in a different part of the works, while a further provision can be made, which should be of assistance in this direction, namely, the installation of a small lathe in the same room as the testing machine, so that the necessary test pieces can be prepared without hindering any of the operators in the Machine Shop. Sliding doors will be found advantageous between the Receiving and Despatch Department and Raw Material Store, so that the material may be taken into store directly the same is passed, without any opportunity of quantities getting into the works except after being properly booked into store.

Next to the Receiving and Despatch Department we have the workers' entrances and timekeeper's office, with passages on either side to enable the carrying out of a proper system of checking employees in and out, while the open lobby will provide a reception hall for travellers requiring to see the works' manager or other officials, also a space for persons making application for work. The passage directly inside the timekeeper's office is terminated by a lobby entrance to the men's lavatories, while next is a mess-room, the entrance to which is from the lobby outside the timekeeper's office, thus ensuring that there need be no people in the works during the meal hours.

The foregoing covers all the offices and the chief departments of supplies for the factory, and we therefore come to the actual workshops, which have been arranged with a view to obtaining centralisation of the different sections as much as possible. On the south side are shown the fitters, welders, braziers, panel beaters, and tinsmiths, etc., with the object of enabling the smoke and other fumes to get straight out of the factory without passing through any other departments. The space to the north of these

departments is provided for the Machine Shop, and may seem in the first instance to be rather large, but, on the other hand, experience gained since the progress of the war has shown that it is almost essential for manufacturers to make all parts if possible, and consequently machine tools are more and more becoming an important factor in the equipment of an aircraft factory.

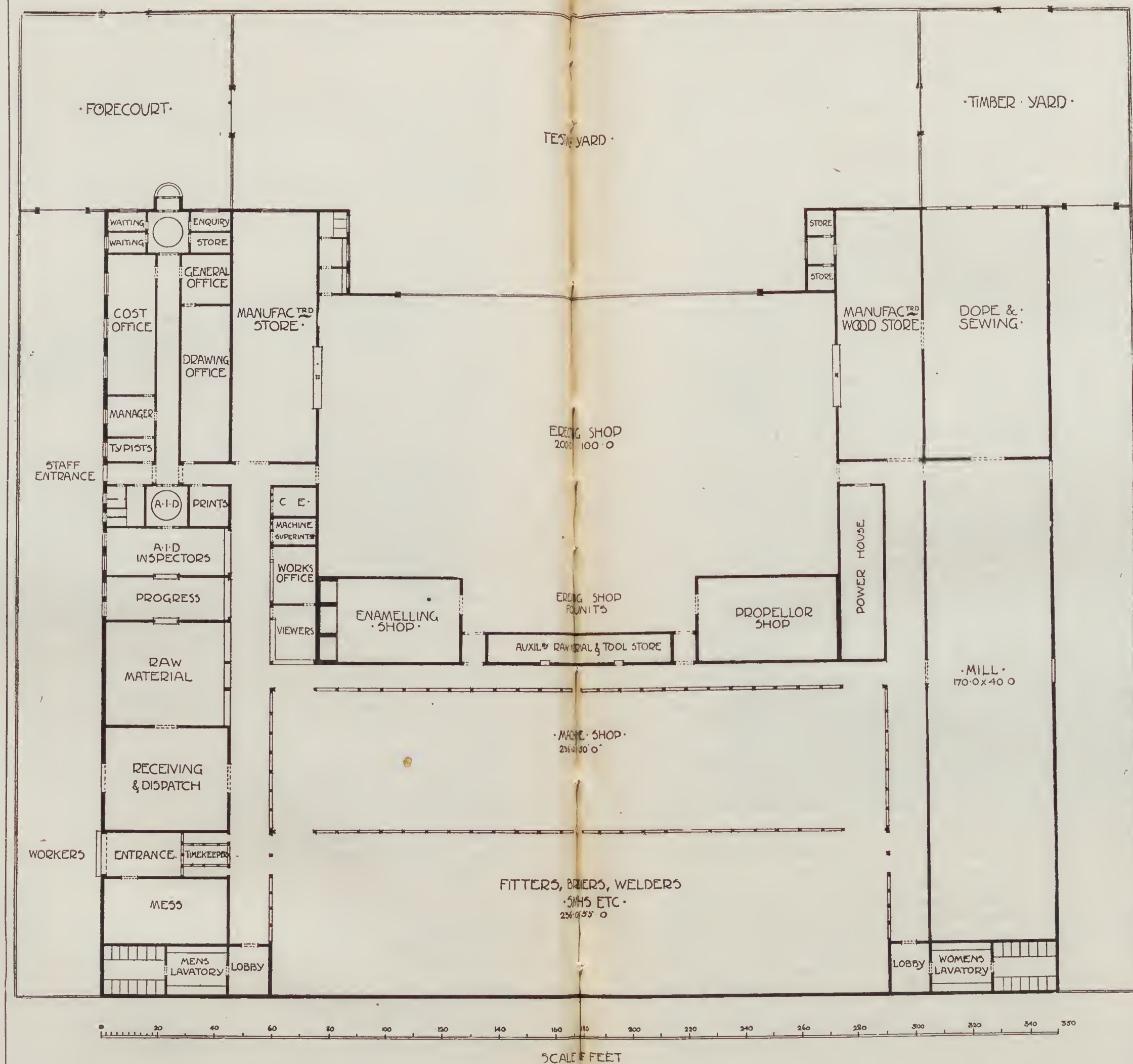
Outside the Machine Shop a wide passage is provided, on the other side of which are the back of departments connected with the erecting and finishing of wood parts, with the exception of the Tool Store, as shown. The disposition of the Tool Store has been chosen, first of all, for the sake of economy in space, and secondly, to enable mechanics and operators to draw the necessary tools with the least delay. It is true that fitters requiring tools or jigs would have to pass through the Machine Shop, but by careful arrangement of this a passage can quite easily be left opposite the Tool Store to enable employees to gain easy access thereto. In this department we have also an auxiliary Raw Material Store; this suggestion is made not for the supply of material to the works direct, but for the storing of stocks of material which cannot be contained in the general Raw Material Store, although in some cases it may be found convenient to keep certain materials in this department, and allow them to be supervised by the tool storekeeper.

The arrangement of the Power House has been made with a view to the Machine Shop and Mill being served at the same time and from the same source, and which should prove to be economical in the question of shafting.

Having disposed of the metal working part of the works, we now pass to the erecting and wood working; in the south-east corner of the works we have the Mill. The area of the shop, it will be noted, is approximately 40 feet by 170 feet. In view of the fact that longer spars are being required as time goes on, it is necessary to have plenty of space for the purposes of not only sawing logs, but also for spindling, and with these facts in view the careful arrangement of the machinery in this department would give the facilities necessary.

On the north side of the metal workers' shops we have, first of all, the departments already referred to, and then the Erecting Department of 200 feet by 100 feet. In considering the question of the lay-out of an aircraft factory, the question of the Erecting Department will always be a difficult one, owing to the fact that the sizes of machines are increasing, while the number actually in the erected condition at one time cannot at the moment be considered a definite quantity, although as time progresses it should be possible to prepare machines ready for erection on the aerodrome without having to keep them in an erected condition for any length of time in the factory. For these reasons it may be suggested that 200 feet by 100 feet is not sufficient space for the Erecting

A DESIGN FOR AN AIRCRAFT FACTORY



Department; but, on the other hand, taking the illustrated plan, there need be no objection to an extension of the shop being made in a northerly direction should it be found necessary, although the opinion of the writer is, as stated, that as time proceeds the necessity of keeping machines entirely erected in the works should be gradually eliminated, thus providing the space for erecting merely the various components.

Turning to the finishing departments, we have, first of all, the enamelling; this department is disposed of in the manner as shown because it deals with metal fittings, and generally just prior to their being placed in the Finished Store.

On the other side of the auxiliary Raw Material and Tool Store there is the Propeller Department, this space being provided for on the assumption that the manufacturer would make his own propellers, while a certain portion of the department can be utilised for storage purposes.

In the north-west corner of the works we have the dope and sewing shops, while next is a yard for unloading timber. At times it may be found necessary to do sewing in the shop for erecting planes, but generally there should be sufficient space to allow the work to be carried out in the proper department.

Next we have the manufactured wood stores. It is not considered practicable to store wood parts in the Finished Store with the metal parts, chiefly owing to the fact that the quantities of metal parts will occupy a considerable space, while the arrangements for the storing of wood parts must necessarily be quite different to those for metal parts. In the manufactured wood stores it will be possible to erect the usual racks for the storing of planes, tail planes, elevators, rudders, spars, struts, etc., and the easy handling and recording of these supplies would be considerably assisted.

In the foregoing all the departments of the works have now been dealt with, and although the space marked testing-yard can be used as a further erecting department if it be found necessary, distinct advantage can be gained by having a yard as shown for testing, while the provision of an open space, as shown, will enable the ingress of timber to the timber yard, which is situated in a manner to facilitate as much as possible the supplies of timber to the mill.

In conclusion, it is necessary to repeat that the arrangement of an aircraft factory will greatly depend upon the site chosen, and in cases where a site is selected of square or rectangular dimensions it becomes comparatively easy to arrange a factory to the best advantage. It is almost essential that a site is not chosen which will jeopardise the proper disposition of the departments and consequently the proper organisation thereof, since the up-to-date organisation of the factory must play an essential part in the regular production of aircraft.

SPECIALISTS IN AEROPLANE BUILDINGS

AMONG the firms that have organised to cope with war conditions one of the most interesting, because of its enterprise and the efficiency of its methods, is the Fairby Construction Co., which specialises in aeroplane buildings, though this is only one of its many branches of activity.

The firm has already erected a large number of airship hangars, aeroplane sheds and factories, and supplied factory fittings of all descriptions, though for obvious reasons no further details can be given in this respect. As an indication of the efficiency of the firm and its rapidity in construction, it may be mentioned that a couple of these hangars, measuring 160 ft. by 80 ft., were completed in the space of four weeks; another, measuring 200 ft. by 100 ft., with eaves 25 ft. high, was completely erected within six weeks; and yet another, of steel construction throughout, and measuring 145 ft. by 150 ft., was finished inside of seven weeks. A factory was fitted up in two days, and a big steel store in seventeen days. With regard to the work of this firm, a correspondent well known to the aviation industry and the air services writes:—

"I must admit that when I saw their advertisements at first I smiled at their decided American flavour. The statements were bold and definite. But time has convinced me that those early advertisements were no more bold or definite than subsequent events have justified. In various parts of the country I have seen their work, and although I am not an expert in building matters, I am sure that it must be as satisfactory as it looks, otherwise I should not have heard such expressions of satisfaction from their customers.

"Although their advertisements do certainly suggest American hustle, the two men behind the company are undoubtedly very English.

"I happened to meet one of them recently at a well-known aerodrome in the North, and to my queries as to the difficulties of building in so many districts in war-time, I got the reply: 'Difficulties, well, yes—but not impossibilities.'

"He told me that most of their jobs are finished in six to eight weeks, as they specialise in speed. In one case I learnt they organised a canteen and sleeping quarters in three days, served 13,000 meals and provided 3,000 nights' lodging. Specialising in speedy work, they do not want slow jobs. For the same reason, they attract the best class of men—those who want to earn good wages. Everything seems well organised. They also have some novel ideas for 'after the war,' and are not among those who go about with long faces, chanting 'Yes, but what will happen after the war?'"

Judging from results, the Fairby Construction Co. has certainly deserved its success. The staff is enthusiastic, the management possesses initiative and enterprise, and is not afraid of introducing new ideas and novel methods. In such a vastly important business as the erecting of aeroplane workshops and hangars, wherein the work has usually to be carried out at short notice and completed at express speed, these qualities are of the highest importance. A particularly happy feature of the firm's activity, and incidentally one of the reasons of its success, are the excellent relations subsisting between the staff and the management, a condition of affairs which is, unfortunately, somewhat rare in these days of labour troubles and trade disputes. Such *esprit de corps* is only too often sadly lacking, though it has been one of the secrets of the success of many of the large corporations in America.

ROOF GLAZING

THE "Eclipse" patent system of roof glazing, doubtless already well known to the majority of our readers, has come prominently to the fore in connection with the expansion of the aeronautical industry, having been widely adopted by H.M. Government for the lighting of aeroplane factories and sheds, recent examples being:—

Royal Naval Aviation Dépôt, Kingsnorth, Kent.

Royal Aircraft Factory, South Farnborough, Hants.

Seaplane Erecting Shop, Medina, East Cowes, I. of W.

The principal advantages claimed for this system are:—

1. It is practically indestructible owing to the astragal being of steel, which is entirely encased in a strong lead cover, which is soldered up at both ends, thereby hermetically sealing the steel from the atmosphere.

2. Water or dust cannot penetrate through the glazing owing to the existence of three lead flanges or wings, which are drawn as part of, and not separate to, the lead cover, the whole being manufactured in one piece.

3. The astragals being of steel are consequently much lighter than wood of equal strength, and thereby obstruct less light.

4. The glazing bars need no maintenance or painting whatever, putty and painting being entirely eliminated.

5. "Eclipse" glazing can be adapted to any form of roof.

Many millions of feet of "Eclipse" glazing have been fixed, and the makers (Messrs. Mellowes and Co., Ltd., of Sheffield, and 26, Victoria Street, S.W.) are prepared to guarantee for a term of years any roof glazed on their system.

IRONITE PROOFING AND FLOORING

THERE is no need to dilate upon the capital importance of perfectly waterproof buildings where aeroplanes are concerned, whether for hangars or for factories. Unfortunately, experience has shown that so-called waterproof buildings turn out to be of a distinctly porous character where humidity is concerned. This is where "Ironite" comes in. "Ironite" is an exceedingly fine powder, chiefly metallic, the waterproofing effect of which is realised by its introduction into cavities to be closed, and subsequent mechanical and chemical union of the powder so introduced with the surrounding surfaces, through oxidation of the powder. Properly applied, it will render the most porous concrete, brickwork, and wood absolutely waterproof against heavy water pressure. It is also being extensively used for coating concrete flat roofs and vertical damp-courses in place of asphalt, and comes out at less than half the cost. It is mixed with water only, and applied with a hair stock brush to new or old buildings, and one great advantage is that the waterproofing can be applied whilst the surface is wet; in fact, if it is dry it has to be wetted down for the proper application. For concrete and brickwork three coats of "Ironite" are necessary, using $\frac{1}{2}$ lb. "Ironite" per square yard. For woodwork only one coat is necessary, using one-third of a pound per square yard.

"Ironite" is being extensively used all over the country. The War Office have used it for coating the concrete hutments at several of the large camps in Yorkshire, about 400,000 to 500,000 square yards, and it has been specified by the Admiralty for use on a large reservoir and at the Royal Naval Cordite Factory, about 10,000 square yards. It is to be used at Knowsley Park Camp on wood. It has been used at Maida Vale, Wood Lane, and other Underground stations, and at various motor garage pits, etc.

A suitable flooring that shall be proof against wear, dust, water, and grease is almost as necessary in aeroplane construction and maintenance. "Ironite" meets these requirements admirably, as we have had a personal opportunity of judging. A microscopic examination of an ordinary concrete floor will show that it is honeycombed with innumerable small cells. When such a floor is subjected to heavy wear, the walls forming the cells break down and disintegrate, causing dusting and "sanding." It is therefore apparent that a concrete floor, in order to permit trucking, etc., must be dense, compact, and homogeneous.

"Ironite" flooring is designed to be mixed with cement and sand for the floor topping. In the process of setting, by reason of the chemical action which takes place, the particles of "Ironite" flooring not only expand and tightly seal the pores and interstices, but also bond the surrounding particles in a much firmer adhesion than is ordinarily

obtained with Portland cement alone. This manner of topping produces a floor that, in addition to being absolutely impenetrable and non-absorbent, is as near to being wear proof as it is possible to make it. Such a floor will resist almost any crush power and tensile strain.

The hardening effect from the use of "Ironite" flooring steadily increases for a year or more until the concrete much surpasses any other artificial stone. The method of application is quite simple, and always effective provided instructions are implicitly followed. All foreign substances and loose pieces should be removed. If the surface be oily it should be cleaned. An application of a solution of one part muriatic acid to twelve parts water brushed into the surface and in a short time well washed with water will generally remove oils or greases. If it is to be used for patching, the crack or hole should be thoroughly cleaned and the edges chipped out.

The floor topping should be from $\frac{1}{2}$ in. to 1 in. or more in thickness, according to the amount of wear the floor is to

essential feature, and can be used for spans up to 130 feet. The advantages of this special form of construction over the ordinary pitch or curved type of roof are as follows:—

1. The cubical contents are very much less owing to the fact that the height to the crown of roof from eaves is only about half of what it would be in the pitched type, and this is a most important consideration if the building has to be heated.

2. Owing to the reduced height there is a saving in external walling, and also in steel framed sheds a very considerable saving is effected in the design of stanchions and bracing owing to the reduction in the exposed surface for wind pressure.

3. The structure is complete in itself, and does not depend on purlins or walls for its stability, as it is entirely steel braced in every direction.

4. The number of stanchions required is generally about half that for the ordinary type of roof, thereby saving foundation work.



ROOF DESIGNED AND ERECTED BY MESSRS. PEIRSON & CO.

receive. To each 100 lb. of cement is added from 15 to 25 lb. of "Ironite" flooring, the two being very thoroughly mixed in a dry state. Ordinarily the use of 20 lb. of "Ironite" flooring to 100 lb. of cement is recommended. However, where very heavy wear is expected, 25 lb. or more should be used. One part of such mixture is used to two parts of sand or crushed granite. Water is added in quantity and manner the same as with ordinary concrete.

"Ironite" flooring is used at several large munition works, factories, garages, etc., among them being the Belgian Munition Works, the B.S.A. Works at Birmingham, and the Clyno Engineering Works at Wolverhampton.

DEMAND FOR LONG SPAN ROOFS

THE type of roof illustrated has been extensively used for buildings wherein uninterrupted floor space is an

5. The underside of the roof being quite horizontal it is a very simple matter to attach runways or shafting to same.

6. The covering of the roof can be arranged on the north light principle if desired. The roof illustrated was designed and erected by Messrs. Peirson and Co., engineers, 17-18, St. Dunstan's Hill, to whose courtesy we are indebted for the loan of the photograph reproduced.

"COPPERLITE" GLAZING AND "LEADISING"

MESSRS. HAYWARDS, LTD., the well-known building ironwork engineers, are a "controlled firm," like most others, and are busy on Government contracts, but nevertheless are doing a good deal directly and indirectly for aircraft development, both in the supply

of quantities of patent roof glazings, skylights, ventilators, iron fireproof staircases, heating plants, etc., for new buildings; and also they are undertaking the making of sheet metal work, light metal parts, acetylene welding, etc., for aircraft components.

Two specialities of general interest may be referred to—"Copperlite" fire-resisting glazing and "Leadising" non-rusting treatment for ironwork.

The former is a special form of glazing, designed to meet the stringent regulations of the London County Council for resisting and prevention of spread of fires in buildings. As its name indicates, it is constructed of plate-glass in squares, in light but strong copper frames, the whole being built up to maximum strength by a process of immersion in electro-depositing copper baths. The result is a strong and handsome form of glazing, which has withstood the searching tests of the British Fire Prevention Committee, and gained their Class A certificate, having resisted a gas-flame furnace test to 1,750 deg. F. (red heat) for one and a half hours, and then an application of water at a pressure of 50 lb. per square inch—all of which it survived intact! Some 7,000 feet superficial is installed at Messrs. Selfridge's Stores, on the staircases and lifts, etc., and quantities are serving in many other large buildings. It might be of great advantage in aircraft fabric works, to secure their safety.



HAYWARD'S "COPPERLITES"

Euston-road, intact after destructive fire next door, saving furniture warehouse.

The other process referred to is "Leadising," which is a system of putting onto iron and steel work a thin but intimately adherent film of lead by means of electrolytic action through a scientific process only lately worked out practically, and which has the greatest advantages, as a very thin film of lead is non-porous and acid-resisting, whilst the weight is inconsiderable, where the attenuation of steel parts that otherwise is liable to result is avoided, and the strength of the parts at full value during the life of the aircraft maintained. Though there are excellent paints and varnishes, they entail more or less constant supervision and attention to ensure anything like the same advantages, whilst with the "Leadising" no further trouble is required.

But these are only two single branches of this firm's activity, for it also specialises in fireproof staircases, steel casements, sky lights, and putty-less roof glazing. The latter is of particular interest to aeroplane factories. Each piece of glass is securely fastened, and is yet free to expand and contract. It is drop-dry and dust-proof. The rolled or cast glass sheets are supported by soft wicks, laid on special galvanised or leadised steel tee glazing bars; stop clips and delta spring clips, screwed or pinned, allow the easy

renewal of a sheet of glass. The panes are usually 24 in. wide, and up to 7 ft. span, with specially heavy bars for up to 10 ft. span.



HAYWARD'S FIREPROOF STAIRCASING

LIGHT CONSTRUCTIONAL STEELWORK

MESSRS. CROGGON AND CO., LTD., constructional engineers, 16 and 230, Upper Thames Street, London, E.C., have been for now over fifty years manufacturers of all kinds of steel and timber framed buildings. The practical experience accumulated during this period enables them to design and turn out structures on the most economical lines, both as regards cost and durability. They specialise in light constructional steelwork, so that the manufacture of aeroplane hangars, etc., could not be more in their way of business.

We are particularly given to understand that quick delivery is the chief feature in their business, and that promises made by them in this direction can be relied upon, for they state that the greater part of their contracts consist of repeat orders from satisfied clients.

They are, at the moment, giving special attention to the manufacture of aeroplane sheds and buildings required in connection with war work, and fully appreciate that contracts for this class of work must, under present conditions, be carried out with exceptional speed, and to this end have provided themselves with large stocks of material in London.

They are on the lists of the Admiralty, War Office, London County Council, and all other public concerns where good work is essential, and have worked under some of the best London and provincial architects.

If desired, we are sure they would only be too pleased to show samples of their work.

IMPERIAL AIRCRAFT FLOTILLA—PUNJAB AEROPLANE FLEET

Early in the year it was announced in India that the King had notified his acceptance of the services of an armoured aeroplane fleet, provided by purely voluntary and unofficial contributions from the Chiefs and people of the Punjab, each aeroplane to be named after one of the great rivers of the province. It was proposed that the fleet should consist of at least seven of the latest type of battleplane to be selected by the military authorities. At the end of January, however, it was announced that the War Office required aeroplanes of smaller dimensions and cost than were originally contemplated, and that this would enable the fleet to be inaugurated at once with an initial strength of 20 aeroplanes at a cost of £45,000, to be added to as funds permit. Nearly £60,000 had then been collected. The planes will now be named numerically—for example, *Punjab 1*—with the addition of territorial designations in the case of donors who have subscribed the greater part of the value of one or more planes.

RANDOM REMARKS

XXXVIII.—VALENTINES. By ARTHUR LAWRENCE

Illustrated by ERNEST COFFIN.

THE passing of St. Valentine shall exact from mine eyes the tribute of a tear. It is just because these are times of inconceivable horror that I regret more than usual the villainous decree that valentines shall pass into limbo. I have sent many myself and even received them—in the days of my youth. They were delicately decorous days, when there were no picture postcards, when the photograph of your favourite



actress cost you half-a-crown or eighteenpence, when a typewritten letter was an insult and a postcard a painful impertinence. The Valentine Proper was boxed. It had its own box. No one ever dreamt of buying any detached covering which would just hold that fine work of art. The Valentine was practically an integral part of the box. So was the scent. The deeper the box and

the finer the scent, the more one appreciated the work of the artist. Always the nice question arose as to whether the paper lacework of the confection and the brilliant hues of the centre would suffer by being contaminated with a mere missive, or by a word which would indicate that this piece of preciousness came from you. With a sure instinct, you realised that this charming phantasy of the artist and poet, this mere bubble of love, were best left alone. Perhaps—thrilling thought—she would guess.

Suppose—of course, it's quite too absurd, and I ought to be ashamed of myself—but suppose quite a young girl—I am thinking of one with inscrutable eyes, proud of mien, shy and reserved, with the soul of an artist, and whose existence (I will call her M.) makes me wish that I were at least twenty years younger, had foolishly sent me a valentine, I should have needed no aeroplane to waft me up to the skies. I should have needed heavy weights to hold my feet to the ground. Perhaps she would have sent me one if she had known that its reception would have reduced my age to something less than twenty-one. But there comes one's caprice. If one suspected that motive and felt that one was being patronised, even in the most kindly way, by some other Ego in the joy of her youth, the world would have grown grim and grey once again. The message of recognition would have been gently pressed to one's lips and then consigned to the flames. The fire in the grate is one of the business advantages of

winter; one can consign to it one's hopes and illusions—and then the flame leaps up, and by some God-given gift one hopes on again.

But, there! I have become sentimental, and, I beg of you, who can be otherwise at the thought of a valentine? On the morning of the fourteenth I found myself toying delicately with a couple of eggs, which might have been fresh when they were laid. They were not subject matter for the red-nosed comedian. They were edible. In fact, they lacked nothing but just that dewy something which you get in the plum which you pick from your own garden wall, or the trout which comes swiftly from Loch Ard to your breakfast. They called for no reprisals upon the man who had sold them. They merely suggested, in the most delicate way, that the train service from Devonshire is not quite what it was. I made the same excuse for the postman. Tribulation

was mine when he passed the house altogether. Moreover, I scanned many shops and found not the slightest sign of a valentine—not even an ugly one. Falling into a reverie, I be-thought myself of the joy of earlier days when I should have sent an ugly one to Ernest Coffin, in which he would be, what he is, a mere pavement artist without any chalks. Harold Nortik would have had one, pasting up contents-bills of "Aeronautics" and advisedly trying to whitewash himself in the process. I should not send one to the editor. He might cut me down to a few paltry pounds for my work, or, worse still, he might treat the pictorial insult with his ghastly aerial indifference. Yet, it is useless repining. Paper lace and colour and scent—and the ugly ones, are seemingly all things of the past. Perhaps, when half the world has ceased slaying the other half, St. Valentine, with a few other saints, shall come into his own again. In the meantime, I pray that you leave me to my meditations.



Away, then, with mere idle sentiment and the thoughts of my youth. Away, for the moment the sweet and romantic thoughts of my young heroine, who is scarcely aware that I exist. Away with that idealism which enables one to breathe in the murk of this life. We will come to the mere sordid facts. And facts, I believe, are always "frankly facetious." It was on the 14th that I minded me of the fact that it is the day of St. Valentine, and Leap Year to boot.

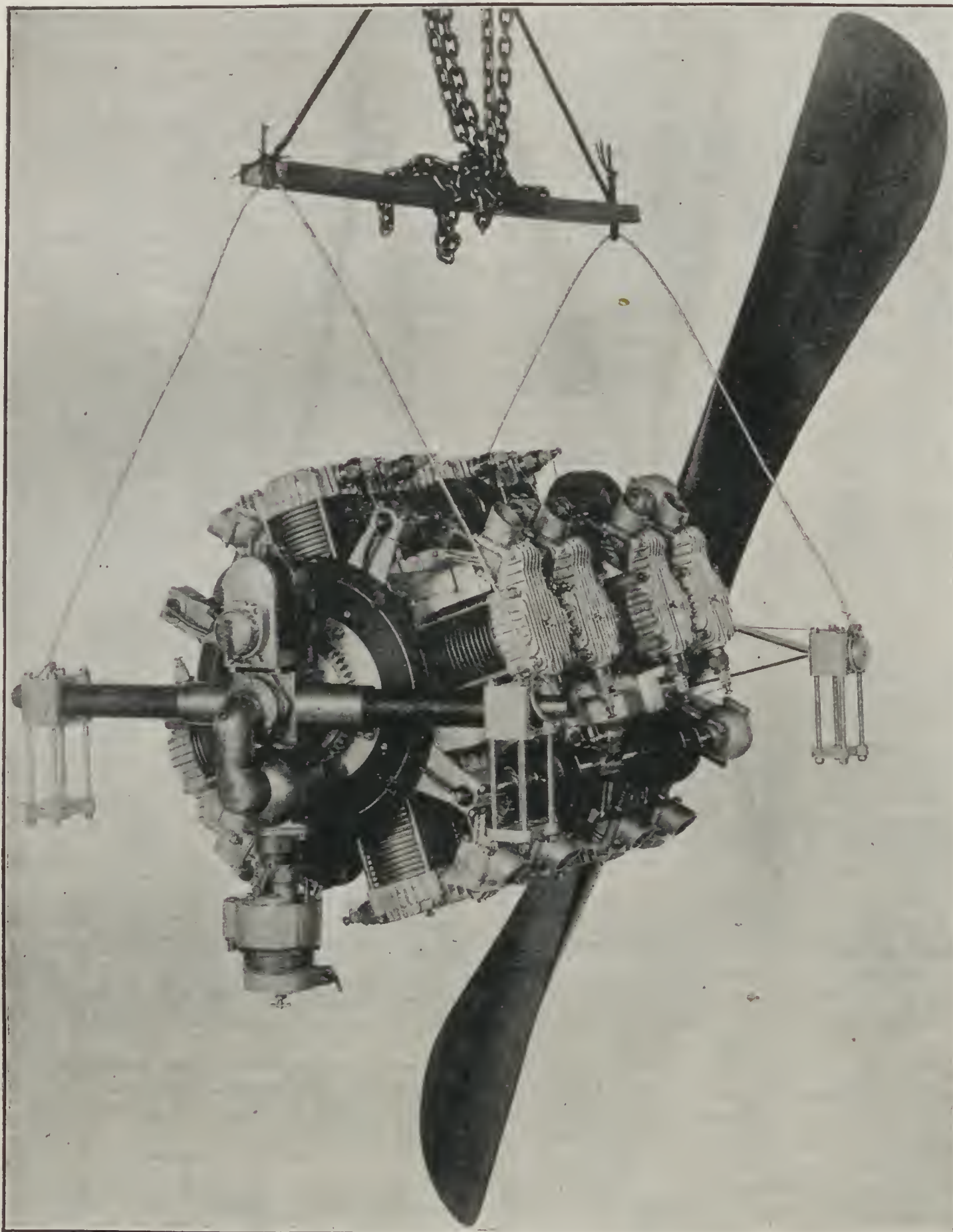
PROGRESS OF AMERICAN AVIATION

By E. LARUE JONES, American Editor

TREBERT ROTARY—A NEW AMERICAN MOTOR.

A NEW motor is now on the American market, built by H. L. F. Trebert, of Rochester, N.Y., a well-known

plane propulsion. The motor has a stationary axial shaft around which the rest of the motor revolves on ball bearings. Designed to be extremely light, strong, and compact, and with only a 25-in. circular radius and approximately 30 in. length. There are sixteen cylinders of 4-in. bore by 4-in.



THE SIXTEEN CYLINDER TREBERT AIR-COOLED ROTARY ENGINE

marine engine designer. Its novel design will draw attention the more particularly to its performances.

This type of aeroplane motor is a sixteen-cylinder air-cooled rotary motor, designed from start to finish for aero-

stroke which develop 130 h.p. at approximately 1,500 r.p.m. (A.L.A.M. rating would be 102.4 h.p.).

All the mechanical operations of this motor are reduced to a minimum of simplicity. Gas is taken from a standard-

make carburetter through the hollow stationary axial shaft and distributed through a web to intake manifolds cast in the crank-case of the motor, none of it entering the base of the motor. From the main manifolds the gas is distributed so that each cylinder is equidistant from the point of distribution. The gas then enters the cylinder below the piston, but still separated from the base by special packings. It enters the explosion chamber through an automatic valve in the head of the piston. After the explosion the gas is exhausted through mechanically-operated valves. The centrifugal force is thus utilised to aid suction in properly distributing and expelling the gas.

Ignition complexity has been the chief objection to multiple-cylinder motors. In this type a single cylinder magneto driven four times the engine speed, with a double breaker box, supplies all the current. This magneto feeds its current into the main distributor, which is a circular contact inserted in it. This circle is broken completely in four quarters, so that each arc of 90 deg. feeds the electrical current to one set of four cylinders lengthwise along the motor. Each of four arcs of the main distributor contact is connected with an insulated wire in the centre of the four hollow cam shafts. In the cam shafts are inserted insulated contacts that tap this wire, and from these last contacts the current is taken to the proper cylinder by a brush contact against the insulated discs fastened on the cam shafts. Mis-firing is thereby rendered impossible, as the same shaft which times the valve action also distributes the electrical current. There is practically no wiring on the motor to get out of order or confuse the driver, as in the case where many wires are led from the magneto to each cylinder.

Lubrication is one of the most important features of any aeroplane motor. The best and most satisfactory practice is a circulating force-feed system, feeding to inside of the bearings. The oil is pumped through the stationary axial shaft, in which are small oil holes leading to each bearing, from which the tiny accumulation is distributed to the pistons and cylinders by centrifugal force. To guard against too much oil getting into the cylinders the pressure is very light, only being that of the small height of the column of oil leading up from the axial shaft to the overflow pipe, through which all the surplus oil runs back into the oil tank.

The cooling system employed is by direct radiation of the heat to the air from numerous fins cast on the cylinders. There is sufficient space between each cylinder (cylinders are cast separately) to allow it to be surrounded by a moving wall of cool air whenever the motor is in operation.

Only the best material and workmanship has gone into the motor, and there have been used the latest in steels and alloys suited by their lightness or great strength to go into this aeroplane motor. Light construction is not secured by in any way sacrificing strength or durability. Many of the special features in design enable the doing away with parts that for this type motor are unnecessary.

Among the chief advantages secured by this type of motor are:—

Absolute freedom from vibration secured by perfect balance and eight light power impulses per revolution;

Strength secured by the design and excellence of the materials used in the motor construction;

Durability secured by the freedom from vibration, the excellence of workmanship and materials;

Simplicity, compactness, and accessibility secured by long and painstaking study in designing the motor as a whole.

Lightness secured by the design and careful selection of light alloys and very strong steels, which can carry great loads without undue weight. Many other little details for the convenience of the driver or operator of the engine have been incorporated in the design, and no effort has been spared, it would seem, to make the motor reach its builder's expectations. No expense has been spared in the experimental work, as Mr. Trebert has been working for several years on this motor alone.

BURGESS ACTIVITY

NINE seaplanes for the United States Navy are now under construction or completed and awaiting shipment from the plant of the Burgess Company at Marblehead, Mass. Six of the total comprise a rush order of the Department for immediate use at the Pensacola Training Station, in accordance with Secretary Daniels's plans for enlarging the flying personnel as rapidly as possible.

On January 13 preliminary tests of the new Navy war seaplane were made. With a load of 300 lb., in addition to sixty gallons of petrol and ten gallons of oil, the big craft gave an excellent account of itself, easily exceeding its contract speed of eighty miles an hour.

The new seaplane is one of an order of three, which are nearly ready for shipment. The specified design calls for the fastest over-water machine ever constructed. The Burgess seaplane, however, goes further than this. It is by far the speediest aeroplane of its size ever turned out either for land or marine work. In addition to this, it is a heavy-weight carrier, tipping the scales at nearly a ton and a half—or 2,850 lb., to be exact—when loaded, and weighing 1,900 lb. light. The total lift, therefore, exclusive of the machine itself is just under half a ton. A climbing speed of 2,500 ft. in ten minutes with full load on board is called for, the load including fuel and oil for four hours' flight, 380 lb. for pilot and observer, and a margin of 200 lb. for instruments and tools, extra fuel, or explosives for offensive work.

The Sturtevant Aeroplane Company and the Burgess Aeroplane Company have each been given a contract for six aeroplanes of the school type for use at the Aeronautic Station for training officers and men. They are tractors, using motors of about 100 horse-power, with a speed of from 40 to 65 miles per hour and a radius of about four hours, and a climb of 350 feet.

A number of twin-tractors of a strictly military type are now under construction at Marblehead, Mass., by the Burgess Company. The design calls for a biplane somewhat similar in appearance to the French Caudron developed since the opening of the war, although differing in many details, and with a considerably increased power plant. The Burgess craft has two engines of 150 horse-power each, mounted one on either side of the centre section, and each driving a tractor screw. Either motor alone, it is estimated, will keep the machine in the air. The two units are entirely independent, and are operated by separate controls from the pilot's seat.

Ability to carry heavy weights has been the chief aim of the designer, W. Starling Burgess, who figures on a total useful load of approximately 1,000 lb., in addition to nearly an equal amount of fuel and oil, with the result that the machine will lift nearly one ton in addition to its own weight. Rapidity in climbing, rather than speed, has also been sought, owing to the necessity for escaping the shells of an enemy's anti-aircraft batteries.

On the centre section is placed the nacelle, with the pilot at the rear and the gunner's seat in front. The bow of the nacelle, if such a term may be used, supports the gun. This arrangement gives an arc of nearly 180 deg. through which the gunner may direct his fire. As the allowance for pilot and passenger is 350 lb., it will be seen that the armament may, if desired, reach a total of more than 600 lb. If necessary, therefore, the Burgess "twin" will be able to carry heavier metal than a machine gun.

In the case of raiding, six bombs of more than 100 lb. each may be transported, or a much larger number of lesser weight. As the speed called for is seventy miles an hour, while fuel for four hours is carried, it will be seen that positions of an enemy at nearly 150 miles distance might be attacked under favourable conditions.

STATEMENTS IN PARLIAMENT

HOUSE OF COMMONS

February 16. *The Government Air Policy*—Mr. Joynson-Hicks (Brentford, U.) moved as an amendment to add at the end of the Address "That this House humbly regrets that no mention is made in the gracious Speech from the Throne of any proposals for placing the air services of the country on a firmer and stronger basis." There was no subject concerning which public feeling was stronger at the present moment, especially in those districts upon which Zeppelin raids had taken place, than the way in which the Government had neglected this matter. The Government had had 18 months since the war began in which to reconstruct and improve the air services; they had known for an even longer period what were the possibilities of the German air service and of our own, and the whole of England knew mainly through the Press which was more wide awake in this matter than the Government had shown themselves to be. (Cheers.) Before the war began and since that date efforts had been made by Ministers to assure the House that all was well with the air services of this country. Where were the "one large and three smaller airships of the latest type" which they were told in March, 1914, by the then First Lord of the Admiralty that the Government had arranged that Messrs. Vickers should construct, and the 15 airships which the right hon. gentleman then said were on order? In the same speech the right hon. gentleman stated that hostile aircraft coming to this country would be "promptly attacked in superior force by a swarm of hornets." Now, nearly two years later, our shores were open to the incursion of Zeppelins in any number.

Who was responsible for this condition of things, and who was going to be responsible in the future? Sir Percy Scott served the purpose of the Government some few months ago when he was appointed to take charge of the gunnery defences of London. He was an eminent admiral, in whom the public had confidence. Now they were told that Sir Percy Scott was no longer in charge, and whether the War Office or the Admiralty had control at present he did not know. It had been stated that arrangements were being made to hand over the entire defences of London to Lord French. If the Government desired a man whose appointment would give confidence to the public they had fixed upon the right man; if they wanted one whose other duties left him no time for this additional work they had found such a man. (Cheers.)

There were three possible defences against Zeppelins—by gunnery, by aeroplane, and by a strong offensive on the other side. He left out defence by Zeppelins because we had not got them, and for this a heavy responsibility rested on the shoulders of the right hon. gentleman who was not long ago First Lord of the Admiralty. In regard to defence by anti-aircraft guns, Sir Percy Scott had been for some months in charge; whether his responsibility was confined to the defence of London or whether it was of a general character he did not quite know. In the last raid six Zeppelins came over the East Coast in daylight. They were seen by hundreds of people and came over low down, as they nearly always did. They were not more than 2,000 feet or 3,000 feet up, and any efficient anti-aircraft guns ought to have brought them down. But either the guns were not fired or they were of no use. He had been told that when a Zeppelin came over the East Coast one big gun did fire and missed, and the effect of the firing was such that the gun rolled over and fired no more.

As to our anti-aircraft gunnery corps, the force that we relied upon to bring down Zeppelins, it had been practising on the East Coast, and at the end of January it had 10 maxim guns which were used in the Boer War and fired rifle bullets. It would be as useful to shoot at an elephant with a peashooter as to fire at a Zeppelin with such weapons. In September last year the corps was provided with a certain number of one-pound and one-and-a-half-pound pompons. Three of these were new at the time of the South African War and five were reconstructed last year. They were the guns which Sir Percy Scott had turned out of London because they were not good enough, and they were sent to the East Coast, the very place where adequate preparations ought to be made to meet the Zeppelins. These guns had fired numbers of times in previous raids, but were of no earthly use.

Now as to the second mode of defence, that by patrols of aeroplanes. Were any sent up on January 31? He was told that our aeroplanes did not ascend, but possibly in one place they did and in another did not. But if they did go up, what did they do? Were they properly armed and capable of coping with Zeppelins, or were they merely machines intended for scouting purposes? After asking how many battle aeroplanes there were at Dover, for example, to fight German aeroplanes when they came over, he suggested that the condition of affairs in our air stations was not such as to enable our men to ascend sufficiently quickly when enemy aeroplanes came across the Channel. Arrangements should also be made for our airmen to fly at night. Then the offensive should be considered. Every Zeppelin shed in Germany was known and could be attacked. Before the war aeroplanes had flown at the rate of 135 miles an hour, had gone up to 25,000 feet, had flown without stopping for 24 hours 12 minutes, and had made continuous flights of 1,250 miles. Why could not our aeroplanes do that to-day? It was because we had not a sufficiency of high-powered aeroplanes; we had confined ourselves to aeroplanes of 100 horse-power while the Germans were using as a general thing machines of from 160 to 200 horse-power. We required a few hundred strongly powered machines with two engines, capable of flying for 10 hours at a stretch and carrying bombs and ammunition. He was not keen on reprisals,

but there were plenty of defended towns to practise on. If we had the machines there would be no difficulty in finding the men for them.

Our machines at the front must be our first care. At present our men at the front were outclassed by the enemy's machines. A member of the House serving at the front had written to him on February 10, saying, "I should like to tell you how regularly the official reports from France seem to me to lie as to our mastery of the air out here. This mastery may prevail elsewhere, it certainly does not prevail at —," mentioning a part of the line where he knew our aircraft were as good if not better than they were at any other part of the line. The letter went on, "What happened on this very day. I was going up the trenches—it was a brilliantly bright morning—and we were held up there while two German machines flew slowly about like a couple of well-trained pointer dogs reconnoitring the whole of our line without interference of any kind except desultory shelling by our anti-aircraft guns, which they treated as usual with supreme contempt." The writer went on to tell how one of our batteries close to him had to stop firing for some hours because there were German aeroplanes flying overhead and they naturally did not want to be spotted. That was an important part of the line, and anybody who read to-day's paper and that letter could see that certain events were not unconnected.

The position was serious. He knew the suggestion he had to make did not meet with universal approval, but he believed that sooner or later the control of both services must be put in the hands of one man. (Cheers.) They must find a man, either military, naval, or civilian, with determination and with a belief in the possibility of the future. It would be impossible to create a new air service, it would be impossible to amalgamate the two air services, but he would like to see transferred to the new Air Minister all the powers of the Army Council and of the Board of Admiralty with regard to the air services. Under him there should be a small staff of good men, a naval airman, an Army airman, and an anti-aircraft gunner. One of our best anti-aircraft gunners in France was now in control of an ordinary battery somewhere else at a time when both here and in France we were crying for good anti-aircraft gunners. Something must be done. The country demanded something more than mere sedative speeches.

Mr. R. McNeill (Kent, St. Augustine's, U.) seconded the resolution. In the recent raid he was informed—contrary to the official statement—that no guns were fired and no aeroplane went up to attack the approaching aircraft. They were told that the enemy aircraft were chased, but his information was that our aeroplanes did not go up to commence the chase until the enemy aircraft were well out of sight across the sea. Moreover, at one particular locality where there were guns, aeroplanes and other means of resisting attack there was during the Sunday midday attack no one in attendance at all except a sentry.

It did not follow that because enemy Zeppelins had done little military damage hitherto they might not succeed in the near future. His hon. friend had said that the chief responsibility with regard to our having no airships at that time rested upon the late First Lord of the Admiralty. He did not himself think that the late Secretary of State for War was altogether free from responsibility in this matter. The right hon. gentleman, speaking in the House on March 19, 1913, said that the Army was not in possession of any large dirigible balloons, not because it was feared to face the expense, but because it was deliberately laid down from the start that the Army at that time did not require Zeppelins, and he went on to say that the only possible use that a Zeppelin could be put to would be to go to India or Egypt. The right hon. gentleman at that time thought that the right method of repelling aircraft attacks was by guns, and he described how the anticipated difficulties with regard to the use of the guns had been overcome. Where were the guns to-day which enabled the right hon. gentleman to come to his conclusion, and with what guns had he made his experiments?

MR. TENNANT'S REPLY

Mr. Tennant (Berwickshire, L.), in replying, said that with a large part of Mr. McNeill's speech he entirely concurred. His hon. friend asked him whether the Government had yet grasped the gravity of the situation, and if the Government were now making proper provision to meet this danger. It had been said that there could be no excuse for inaction or for the want of preparation, because this was no new matter. But if this were not new, was it not an experimental matter? It was an experimental service. The whole air service of this country was constantly developing from day to day, and almost from hour to hour.

In so experimental a service as this it would be absurd in any Minister to pretend to anything in the nature of perfection, and that claim had never been made. There were three cardinal purposes for the use of aeroplanes; first, reconnaissances, including observation of the enemy's position and artillery observation; secondly, fighting, including the use of guns; thirdly, for bombing purposes—the bombing of some vulnerable point or structure belonging to the enemy. But now there was a new problem, and the very fact that it had arisen in the dimensions they saw at the present was a practical demonstration of the novel and experimental nature of the service. So far as London and the arsenals and fortresses and other vulnerable points were concerned, we had made great strides to provide a proper equipment and a proper defence. He did not wish by that to say all our arsenals and all vulnerable points were safe, for the complete defence of every part of the United Kingdom against long-range aircraft could never be

complete, and if it were carried out even partially would impose an intolerable strain. The most that could be done was to make an endeavour to protect the vulnerable points in such a way that the enemy's probable loss would be so great as to act as a deterrent.

I will tell the House (Mr. Tennant continued) what actually the Government have done. The hon. member said we had been changing our policy and that the defences of London were being handed over from the Admiralty to the War Office and then shunted back to the Admiralty, and he wanted to know where we were. He really has no right to make that charge against us. It is true that at the outbreak of war my right hon. friend who was then First Lord of the Admiralty did take over the defences of London, and they were under his charge until quite recently. As from February 16, that transfer has been effected. It means that under the provisions which have been agreed upon the Navy will undertake to deal with all hostile aircraft attempting to reach this country, while the Army will undertake to deal with all such aircraft which reach these shores. All defensive arrangements on land are to be undertaken by the Army, who will also provide the aeroplanes required to be worked by the home defence troops and to protect garrisons and vulnerable points and to provide the flying stations required to enable the aircraft to undertake those duties. The Navy will provide the aircraft required to co-operate with and assist the fleets in watching the coast and will organise and maintain such flying stations as are required for their aircraft. The War Office will be responsible for demanding the necessary armament, guns, and ammunition from the Ministry of Munitions, and for the design and supply of *matériel* for the naval and military air services.

Further than this, a standing joint naval and military committee will be formed to collaborate in and co-ordinate the question of supply and design of *matériel* for the naval and military air service. This committee will hold those informal conferences which I should like the House to realise have not been very rare in the past.

Mr. Joynson-Hicks: Has Sir Percy Scott now finished—has he no longer anything to do with it?

Mr. Tennant: I hope the hon. gentleman will not go away with any idea of that kind. Sir Percy Scott is still in the position he was in—in other words, there has been no change up to now in his position.

If the arrangement which I hope is going to be completed is actually completed his services will be transferred from the Admiralty to the War Office, but it is a little inconvenient to answer this question when the actual arrangement has not quite been completed. The right hon. gentleman added that steps had also been taken by the Home Secretary and Postmaster-General for warning the various centres of the coming of aircraft, and the Postmaster-General would state what they were. It was incorrect to say that aeroplanes did not ascend when the last raid took place on January 31. It was impossible to have aeroplanes all over England ready for such attacks. That could only be done by denuding the Forces at the front of aeroplanes, and no hon. member would think it right to take that course.

Sir H. Dalziel: Order more.

Mr. Tennant said the Government had ordered and ordered and ordered. He could not give figures, but he could assure the House that the manner in which our air services had been expanded was marvellous. To say "Order more" was not a helpful observation.

Sir H. Dalziel: Why did you not order these things 18 months ago?

Mr. Tennant replied that they were ordered 18 months ago, and had come forward literally in hundreds. New machinery had been devised from which they hoped there would be the very best results. What the Government could, and would, do would be to provide more guns, which were on order, more aeroplanes as soon as they could get them, more pilots, and generally a larger *personnel* and more material for the purpose, for they realised the very grave menace to unprotected people. The numbers of casualties incurred, grievous though they were, were not really very large.

Mr. Herbert Samuel (Yorks, Cleveland) gave a brief description of the measures taken by the Home Office in that comparatively modest part of the question which lay within its sphere.

The system of warning, which was of a very elaborate character, was now nearly completed, and, he thought, would operate satisfactorily should another raid take place. If the people of a locality, through their local authority, expressed a desire to have public warning, they could make the necessary arrangements. The experience of the Home Office on the whole led them not to advise warning the general population. In the Eastern Counties, which had had most experience of these raids, the majority of the police and of the local authorities were against warning the population. Several towns which had adopted arrangements to warn the population have, after experience, abandoned it. One place upon which there had been one raid had since then sounded a hooter whenever it was anticipated that the Zeppelins would visit the town, and the population had been alarmed since that date on no fewer than twenty-four occasions, and no Zeppelins had visited the place. In respect to London, he found that if a system of warning the population had been adopted since the beginning of the war, putting aside occasions when mere rumours had been spread, the circumstances would have justified, and, indeed, would have required, warning to have been given on six occasions for every one on which the Zeppelins had actually visited London. For these and other reasons the Metropolitan Police did not propose, as at present advised, and on the basis of our existing experience, to warn the population of London at large as to when raids might be anticipated. The third step which had been taken since the last raid took place had been to give the Press much greater liberty in reporting the actual circumstances of the raid.

Mr. Ellis Griffith (Anglesey, L.) regarded the proceedings mentioned by the Home Secretary as steps in the right direction.

Ministers had said that we had a perfect gun and that it was easy to hit Zeppelins and that we had hornets that would destroy the Zeppelins when they came. The experts who were responsible for these statements were still advising us.

Very few of the men who were advising the Government at the War Office and the front in regard to the air service had any real flying experience. Of the six brigadier-generals in the air service only one had flown at the front, and men were made squadron commanders with practically no experience of flying. Nobody pretended now that we had the ascendancy in the air with which it was said we began. He knew a great deal about the matter that could not be said in the House, but all he knew and had heard led him to the conclusion that the Army and Navy were not co-operating in this matter. They were rival purchasers against one another. He was informed that one Department would sometimes buy more machines than it needed in order to have a plentiful supply, although they might be necessary for the other branch. He asked the Government to try to co-ordinate the two Services.

Was there an alighting aerodrome anywhere near London?

Mr. Tennant: Yes, there is.

Mr. Ellis Griffith said he understood the right hon. gentleman that there was adequate accommodation for aeroplanes to land at night in the neighbourhood of London.

Mr. Tennant: Some. I never said adequate.

Mr. Ellis Griffith: Inadequate accommodation. (Laughter.) The sooner it was made adequate the better.

Mr. Balfour (City of London): My right hon. friend said he knew of a great many inventors who have come to the Government with excellent inventions, and that the Government had the cynical indifference to reply that they were not in a position to lend the money until the invention had been proved. If my right hon. friend had any acquaintance with the mass of inventions, of which 999 out of 1,000, or even more, are completely worthless, and of those which are not worthless a large percentage has been already anticipated by similar devices, running on parallel lines, he would know that although undoubtedly cases may occur of something which might have been developed not being developed, yet, on the whole, so far as the Admiralty is concerned, it is not a charge which can be substantiated to any great extent.

Another thing I regretted to hear from my right hon. friend was his criticism of the flying operations at the front. That is not a matter on which I pretend to have the smallest technical knowledge. It is not connected with my Department. But surely all of us know that the way in which the flying arrangements at the front have been developed is really one of the glories of the British Army. My right hon. friend seems to think that no man ought to be connected with the flying service unless he can fly. I think that is a profound mistake. The power of dexterously managing an aeroplane is no doubt a very useful thing for every man connected with the flying service to possess. But the capacity to administer and organise, the power of seeing what machines are required at the moment, and what kind of machine will be required in the future, has no connection with the actual training of a pilot or observer.

The right hon. gentleman desires to see a separate department for the air. I hope, if that department is ever developed, it will not be on the lines that a man is to receive promotion precisely as he shows daring, skill, and dexterity as a flyer or a pilot.

What I have felt all through this debate is that the House has not realised that the provision of material for dealing with air problems is only part of a much larger question of how material generally is to be provided. The difficulty the Allies have had from the beginning is the difficulty of material. The Central Powers had made every preparation for the colossal contest.

It is a matter of notoriety that we had not made preparations. Neither in this country, nor in France, nor in Russia, nor among the other Allies were there adequate preparations. Our own preparations at the beginning of the war were quite adequate for the Expeditionary Force. The Expeditionary Force has been expanded tenfold in the field, and the expansion of the Navy has gone also to an extraordinary extent. What has happened to those Services has happened to the flying service. The expansion of the flying service since the war began has also been phenomenal. The material for that expansion had to be provided; and we are still behindhand. We cannot get the things. But the orders are coming in. The whole of this flying business is new in practice. How could any Government have foreseen?

All the manufacturing possibilities of this country, of Allied countries, and of America are used to the utmost by this country in getting the necessary air material. The efforts have been unceasing. They have not nearly reached their full fruition. The orders that have been issued are not nearly completed. No one desires aggressive action more than I do. The Government are entirely alive to the advantage of it. But aggressive action requires very powerful machines, which is a matter of very slow development as compared with the necessities of the case; and that, not because the Government have not done their best to develop the service, but because it takes time to develop it in the existing scale of manufacture.

Nothing could be more misleading than the suggestion that before the war began there were in existence machines that went 140 miles an hour and could keep up for 20 hours. Those were not machines that could be used for the purpose of warfare. They were special machines built for special pilots and for a special purpose. They were great efforts made by particular experts to break the record; and you cannot work the air service on those lines. The machine that remained up in the air 20 hours on a single voyage was a machine which carried nothing at all but the necessary petrol. Every stay and every wire

rope had been fined down to a point which made it just barely possible that this record performance should be gone through, but made it utterly impossible that any such kind of machine should be used in the rough and tumble of everyday warfare with the ordinary average pilot.

The mere fact that some one was in the air 20 hours before the war has literally no reference to anything that can be done during the war, and it is irrelevant to this debate. I am sure that my hon. friend did not mean to mislead the public, but anybody who reads the speech of the hon. member—unless they do me the honour to read my correction of it—will come to the conclusion that there were all kinds of machines in existence before the war which could have been used for long-distance voyages and which the stupidity of the Government has prevented them making full use of. It is this question of material and also of men which lies at the root of this matter. It has been pointed out that they have not more men and machines at the front than are absolutely necessary for the work of the Army, and that you cannot withdraw men from there and bring them here to carry out aerial defence. That is undoubtedly true. Both the Army and the Navy have been enlisting, training, and building as hard as they can since the beginning of the war.

I think it was my hon. friend who opened the debate who asked how was the coast to be defended and what was the use of a machine-gun against a Zeppelin. A machine-gun, he said, only fires a bullet and a bullet is no use against a Zeppelin. That is quite true. Then he said: "Pom-poms were brought down. What were pom-poms? Pom-poms were guns not good enough to defend London. But although rejected by Sir Percy Scott for London they were thought good enough to go and defend the coast." That sounds to people totally ignorant of the facts a plausible argument. It would have been interpreted, again, by anybody who did not take the trouble to read my correction of my hon. friend, as meaning that the Government had plenty of good guns but only sent pom-poms that were bad guns to the coast.

The hon. gentleman said, "You have had 18 months to make guns. Why are not these guns there?" At this moment we are deficient in guns. The Navy has not got all the guns it wants. If there is a pom-pom on the coast where there ought to be a better gun it is not because the Government were oblivious of the fact that guns were required, it is not because the Government have been idle in getting guns; it is because the manufacturing resources of the world have been inadequate to meet the necessities in material for this war.

My hon. friend says that he has been to the front and has seen any number of airmen, who have said, "If the Government would only give us a long distance machine we would go and destroy Essen or carry out some other great aggressive operation." As if the Government had the machines which they refused to these people! We have not reached finality. The process will go on, improvement will go on. The quality, the quantity, the strength, and the power—all are in a state of transition and neither my hon. friend nor I nor any other Department of the Government concerned are going to come down to this House and say that in this rapidly growing and rapidly changing branch of warfare we can see our way to the final organisation and final provision of all that is required to carry out either offensive or defensive warfare.

I might perhaps make one observation upon what my hon. friend the mover of the amendment said about Zeppelins. Personally I think an error was made when we deliberately after consideration refused to follow the German example and try to develop lighter-than-air ships on a considerable scale. But do not let the House suppose it was an easy decision that had to be taken or an easy problem that had to be solved. I think myself we should have been better situated if we had gone in for Zeppelins eight or ten years ago. No doubt we should have lost a great many, and there would have been a great outcry about money having been wasted and many lives risked. I dare say I should myself have been among that band of critics. But looking back, I am sorry that we did not develop a rigid lighter-than-air ship not so much for the purposes of aggression and defence as for the purposes of maritime and air-seout duties. We are doing what we can at the Admiralty to remedy that state of things, but I do not pretend to the House that when you begin this race against an enemy who has had a ten-years start or more there is any immediate probability of catching him up. I do not think there is. Something may be done, and what can be done is being done.

Mr. Brookes (Mile End, U.) in a maiden speech heartily supported the policy of appointing a Minister of Aviation. Aircraft, it should always be borne in mind, were rapidly becoming the most terrible engines of offensive warfare, and it was quite possible that in the near future they might become decisive factors in the war.

Mr. C. Harnsworth (Beds, Luton, L.) said it might be possible for the heads of departments to satisfy a small committee of members of the House, but he was not sure that much progress could be made in that direction. The most important thing was to satisfy the opinion of Parliament generally and of the public outside. The speeches of the First Lord of the Admiralty and the Under-Secretary for War had illustrated the great disadvantage which arose from divided control. They had spoken with uncertainty, as men to whom this was not the most important matter under their charge, and they had not thrown any great amount of light on the subject. He was certain nothing less than the establishment of a separate Department for the air service would be adequate. They had seen what had been done by the establishment of a Ministry of Munitions and they should have a similar Department for the air service under a man of push and go like the Minister of Munitions if they could discover him. Within a few years, and possibly before the end of the war, a separate Department would be believed be established ranking equally with the Admiralty and the War Office.

Sir H. Dalziel expressed great dissatisfaction with the three different statements from the Front Bench, and declared that not one of them would increase the confidence of the country in the Government in regard to the air service. The Government did not know even now what their policy was. The First Lord of the Admiralty did not pretend that everything had been done that might have been done, or that the defence of the country was satisfactory.

Would the right hon. gentleman allow a committee of three members to look into the date when orders were given in regard to aircraft? It would, he believed, be found that orders were given, not 18 months ago, not 12, not even six. And as to the plea that material could not be got, why, for six months after the war started engineering works were working half-time, while American manufacturers had been turned down. It was idle to say material could not be got. The real explanation was not want of men or material, but absolute neglect on the part of the Government.

Mr. Bonar Law: In my belief the British Air Service at the front today is as good as, if not better than, that of any of the other combatants in this war. That is the fact. That does not mean that things are hopelessly bad; still less does it mean that the Government is not trying to remedy them.

It is quite true that there has been competition between the two services, and there is waste in that way. But that is precisely what the Government are trying to stop. I am very far indeed from making any pretence that we as a Government are satisfied with this service.

Mr. Joynson-Hicks said that after the right hon. gentleman's statement the amendment would not be pressed to a division that day. But his own personal feeling, which was shared by many members, was that they could not regard the defence made by the Government to the arguments in that debate as a satisfactory defence. He asked leave to withdraw the amendment.

QUESTIONS

February 17. *The Fokker Battleplane*—Mr. Tennant, in answer to a question by Sir C. Hunter (Bath, U.) as to whether Mr. Fokker, the Dutch inventor of the present German battleplane, offered his invention to our air authorities, said: Mr. Fokker offered to the War Office in 1913 a type of aeroplane invented by him. As the machine was inefficient and dangerous it was not adopted. Subsequently to the outbreak of the war Mr. Fokker produced a new design which was an imitation of the Morane Saulnier monoplane, this being a French design. This design was not offered to the British Government, but was used in small numbers by the Germans, and a machine of this type was amongst those lately on view on the Horse Guards Parade. Mr. Fokker afterwards produced another modification of the Morane Saulnier monoplane with an engine of much greater horse-power, but this design, like Mr. Fokker's second design, was not offered to the British Government.

Sir C. Hunter: Can the right hon. gentleman say which design the Germans are using now? Is it the last design?

Mr. Tennant: Yes; it is the last.

PROTECTION AGAINST AIRCRAFT

Mr. Tennant, replying to Sir Henry Craik (Glasgow and Aberdeen Universities, U.), said: The Field-Marshal Commanding-in-Chief the Home Forces is himself responsible for organising the protection of the United Kingdom against hostile aircraft. The Field-Marshal has at his disposal the advice of the best experts, not only in gunnery and aviation, but also in many other services of equal importance to aerial defence. It must be obvious that measures which are taken for the anti-aircraft defence of the country are military operations of great importance, and in common with other operations of a like nature their efficacy depends largely upon the amount of secrecy maintained.

In answer to a supplementary question. Mr. Tennant added that, as regards inquiries demanding an immediate reply, the nearest person to apply to would no doubt be the military authority in any district, who was under the authority of the Field-Marshal Commanding-in-Chief.

Mr. Tennant informed Mr. Bennett Goldney that he could not publish information as to the flight of Flight Commander Penn-Gaskell on the occasion of the second raid on the Eastern Counties, but he would be glad to give the information to responsible authorities.

HOUSE OF LORDS

In the House of Lords, on February 17, Earl Kitchener, Secretary for War, made the following statement: I have no reason to complain of the manner in which the noble lords have introduced and dealt with this very important subject, but your lordships will I am sure, realise that the public discussion in Parliament of our system of defence against aircraft cannot but be fraught with the risk of giving information and assistance to the enemy. This consideration also hampers very greatly any reply in detail to the questions which have been raised, and I hope noble lords will forgive me if I do not enter further into many of the remarks which have been made, but which will receive our most serious attention. I may inform the noble lord that in the War Office there is no gasbag school, and whatever may be the outcome of what we have to do for the defence of this country we shall not be affected by any preconceived notions. With regard to the Farnborough manufactory, I would like to point out that it is really in the closest possible touch with those who are serving in the field and that our aeroplanes are not built at Farnborough except in very small quantities. There is a constant interchange of information and specifications, which are made out at Farnborough and put out to firms of contractors. Every new type is being tried in the field.

I think we must be on our guard in this discussion that any observations on this subject made in Parliament or in the Press do not have

the effect of making the enemy believe that the moral and material damage which has been caused by air-raids on England has been greater than is actually the case, and thus encourage the Germans to repeat these raids. Up to the present, hostile air invasions of England have had no influence whatever on the military conduct of the war. We all have full confidence that the great courage and coolness hitherto displayed will continue undiminished in any future attacks by the enemy's aircraft on this country, for it must be realised that in war it is not always possible to ensure safety everywhere. Some risks must be accepted in order to be strong at the most important point.

Hitherto in regard to aeronautics the War Office has been primarily interested in dealing with the requirements of the various theatres of war, and although I have observed that criticisms have been levelled in another place at the Air Service at the front in Flanders, I can assure your lordships that these criticisms are unfounded and unmerited. No service in the field has, in my opinion, been more efficient than that of our Flying Corps, directed as it is by officers of the highest technical capacity and manned by pilots and observers whose skill and courage are unsurpassed. I may say that in our Flying Corps there is no officer who has not had full technical knowledge and a pilot's certificate.

It is, however, with home defence—the responsibility for which has been taken over by the War Office only within the last few days—that the noble lord is most concerned. I may say at once, as regards Zeppelin attacks, that it is beyond our power to guarantee these shores from a repetition of incursions; but, although we have only one example of a Zeppelin being destroyed by aeroplane attack—I allude to Lieutenant Warneford's gallant action—there have been several cases in which we have so disabled the enemy's aircraft as to bring them eventually to the ground or to render them useless for further service. During the last raid, while we are sure that one airship was lost at sea, we have very good reason to believe that a second was placed out of action.

There are three principles which govern our air defence in this country: (1) Good information as to the arrival and movements of hostile aircraft; (2) defence by artillery from the land; (3) attacks in the air by aeroplane as moving more rapidly than Zeppelins can travel.

As regards the first, a system has been adopted which I am confident will give us sufficient warning of the impending arrival and probable movements of airships. Arrangements have been made with the Post Office so that all local centres will have thorough and timely warning, and, in order to co-ordinate local efforts for defence and to take charge of artillery action, and lights, special officers are being appointed at all the principal centres, whose sole duty it will be to organise the defences of the areas entrusted to them.

As regards the second point—artillery, owing to our largely increased ordnance requirements, there has been grave difficulty in securing an adequate supply of anti-aircraft guns, but I may inform your lordships

that the construction of anti-aircraft guns has now priority over other ordnance, and as fast as these guns are produced by the Munitions Department they will be distributed to the best advantage throughout the country.

Guns, though they can make Zeppelins rise to a height whence observation is probably difficult, cannot with any certainty hit the Zeppelins and thus arrest the discharge of the destructive bombs which they carry. This can only be effected by the annihilation of the machine itself. Hence the third principle I have mentioned is an important adjunct of our operations.

The attack by aeroplanes at night is attended by great difficulties, many of which will occur to your lordships, but these, we believe, with more extended practice, will in a great measure be overcome. One of the most important points affecting the defence of this country as well as our operations in the field, is the provision of aeronautical material. Large orders have been given, and large supplies have been delivered and are becoming available in increasing quantities. But as flying machines, like artillery, are an adjunct of both Navy and Army, it has been found advisable to co-ordinate the supply of engines and machines by the establishment of a sub-committee of the Committee of Imperial Defence to deal with the relative requirements of the two services. Your lordships will, I am sure, agree that arrangements for anti-aircraft defence are as important as any other for the service of the country, and, as in all military undertakings against a vigilant enemy, secrecy is an important factor in our calculations for success. The War Office have during the last few days taken over responsibility for home defence, and it will be placed in the hands of Field-Marshal Lord French, who will, I am glad to say, have the help of Sir Percy Scott as his expert adviser.

NEW GUNNERY ARRANGEMENTS

The noble lord said that naval men who had charge of the guns are being removed. I am afraid the noble lord was a little mistaken in that. The new garrison artillery who have taken over the guns for the defence of London are for new guns, newly-mounted and they do not take the place of naval gunners. They are also selected men who have been shooting at enemy aeroplanes at the front. I am glad of this opportunity of being able to assure your lordships and the country that the War Office will leave no stone unturned in its efforts to improve to the utmost extent our home defence against Zeppelin raids, and we shall continue to take such energetic steps in the development of our service in the air as shall enable us to inflict the heaviest penalties on the aggressors. In answer to Lord Peel I may inform him that no order has ever been sent to a pilot of the Royal Flying Corps to make an ascent at night to attack a Zeppelin. Notice is given to each station when it is time to ascend, if the Zeppelin is to be intercepted. The decision whether he will fly or not is left to the senior officer on the spot, and if he decides that the weather is suitable the senior officer is the first to ascend.

AIRCRAFT IN ACTION

ENGLAND

February 14—Enemy Machine Driven Down—Yesterday (February 13) there were seventeen fights in the air. As a result of one of these, a large hostile double-engine machine was driven down in the enemy's lines.

February 20—Attack on Cambrai Aerodrome—A successful night air raid was made by our aeroplanes against Cambrai aerodrome, bombs being dropped on and exploding inside the sheds. The machines returned safely.

February 20—Seaplane Raid on East and South-East Coasts—War Office announcement:

"Four German seaplanes carried out a raid over the East and South-East Coasts at about noon to-day.

"The first raiders, two in number, both biplanes, appeared over Lowestoft at 10.55 a.m. They circled over the south side of the town for about five minutes and dropped bombs. In about five minutes they rose to a great height and seemingly vanished. At 11.10 a.m. the two seaplanes were again over the town, and then vanished eastwards again. Altogether seventeen small high-explosive bombs were dropped. There were no casualties. Considerable damage was caused to the outbuildings of a restaurant and to two dwelling-houses. Two naval seaplanes went up at 11.5 a.m. and pursued the raiders, but without result.

"Meanwhile two other German seaplanes were making for the Kentish coast. The first passed over the Kentish Knock light-vessel, dropping bombs in that vicinity at 11.20 a.m. The last raider made straight for Walmer, reaching that town at 11.27 a.m. Flying at less than 3,500 ft. altitude it dropped six bombs, and turned sharply back to the east. Two bombs fell destroying roofs and breaking windows in the neighbourhood. One of these bombs fell close to a church, blowing out the windows as the congregation were singing the 'Te Deum.' A third bomb fell on the roadway running along the beach, killing one man (civilian) and injuring one Marine. The total casualties amounted to two men and one boy killed and one Marine wounded. Two of our aeroplanes went up from Dover and were over Walmer at 11.15 a.m. They pursued the raider, but apparently could not overtake him."

FRANCE

February 20—Raid on Dunkirk—An enemy aeroplane dropped several bombs on Dunkirk without doing any damage. Another machine last night (February 19) dropped two bombs which fell in a field south of Lunéville.

(See German Official.)

DARDANELLES

February 15—Two Russian Aeroplanes Brought Down—Turkish official: "Two Russian aeroplanes were damaged by our fire and were compelled to descend."

February 19—Hostile Aeroplanes Driven Off—Turkish official: "Three hostile aeroplanes flying above the Narrows were driven off by our fire."

MESOPOTAMIA

February 13—Bombs on Kut—War Office communiqué: "General Townshend reports that an aeroplane flew over Kut dropping two bombs, and that no damage was done."

February 16—Bombs on Kut—Turkish official: "On the Mesopotamia front one of our aeroplanes flew over enemy artillery positions at Kut-el-Amara, successfully dropping twelve bombs, which had a great effect."

BELGIUM

February 15—Bombs on Handzaeme Aerodrome—As reprisals for the recent bombardment carried out by the enemy airmen one of our squadrons dropped sixteen bombs with success during the course of last night (February 14) on the aerodrome at Handzaeme.

(Handzaeme is thirteen miles north-east of Ypres)

RUSSIA

February 15—German Aviators over Riga Sector—German aviators appeared over the Riga sector.

Enemy Machine Brought Down—On the Middle Strypa our artillery fired upon four enemy aeroplanes. One of the aeroplanes was hit and fell in the enemy's lines.

February 16—Russian Airship Raid—On the 14th one of our airships attacked the town and station of Podhaice, dropping seven bombs weighing each a pood (36 lb.) on the station and five bombs of two poods each and three of one pood each on the supply depôts in the town. Enemy aeroplanes were encountered by the airship, but they avoided a fight and fled.

(Podhaice is a town in Galicia, about fifteen miles behind the Austrian front on the Strypa.)

German Airship in the Riga Sector—In the Riga sector a German airship, which was ascending to the north-east of Repe, was compelled to come down again, having come under the fire of bombs from our heavy howitzers.

February 18—Zeppelin Activity in Russia—Raids by enemy Zeppelins and aeroplanes have become more frequent above the sectors of Riga and Dvinsk and bombs have been dropped at many places in both regions. Near the Baldon road there was violent cannonading. Our aviators threw bombs in the German lines south of Dalen Island. In Galicia, on the 16th, our aviators threw bombs on Buczacz.

February 19—Captive Balloon Forced to Descend—Our heavy artillery forced a captive balloon which was ascending near Yezerno, north-west of Tarnopol, to descend.

February 20—Aerial Activity on Riga Front—Enemy aeroplanes appeared at several points over the Riga district, and a bomb was dropped on Riga.

In the region north of Kreuzburg a German aeroplane dropped several bombs. North of Dvinsk two Zeppelins flew over Mishtel.

ITALY

February 19—Raid on Laibach—In reply to the numerous violations of international law persistently made by the enemy since the beginning of the war, yesterday morning (February 18) a squadron of our Caproni machines made a raid on Ljubljana (Laibach—a strategic town of great importance situated well behind the Austrian front). During the whole of their journey they were subjected to the fire of numerous anti-aircraft batteries and attacked by enemy aeroplanes, but nevertheless our brave aviators succeeded in attaining their object. Dropping from the clouds to a lower altitude when they got over the town, they dropped some dozens of grenade mines and bombs. One of our Caproni machines being attacked and surrounded by six Austrian machines was forced to land in enemy territory. The other machines returned safely to our lines.

(See Austrian Official)

GERMANY

February 14—Air Squadrons Attack Railway Buildings—German air squadrons attacked railway buildings and troop camps of the enemy at the northern portion of the front.

February 15—Russian Machine Brought Down—Near Grobla, on the Sereth (north-west of Tarnopol), a German battle aeroplane shot down a Russian machine, the pilot and observer of which were killed.

February 17—Attack on Railway—Our aviators attacked Dvinsk, and the railway establishments at Wilsika.

February 18—Bombardment of Poperinghe—Nocturnal enemy aerial attacks in Flanders were immediately returned by our aviators with an aerial bombardment of Poperinghe (behind the British front).

February 19—Poperinghe Again Attacked—Our aviators successfully attacked the flying ground south-west of Poperinghe, and the railway stations in the vicinity.

February 20—English Biplane Shot Down—In an aerial fight east of Péronne we shot down an English biplane equipped with two machine-guns. The occupants were killed.

Our aviators bombarded numerous places behind the northern enemy front, and also Lunéville.

(See French Official)

BALKANS

February 18—Attack on Hudova—German Official: "Enemy aviators attacked the railway station of Hudova, in the Vardar Valley, to the south of Strumitza."

AUSTRIA

February 19—Italian Raid on Laibach—The action of the Italian air squadron against Laibach had a lamentable result. The majority of the aeroplanes were already compelled to return when they reached our front. Three reached Laibach and dropped bombs there and at several places in the neighbourhood, but entirely unsuccessfully. When they returned our aviators attacked them and brought down a big machine of the Caproni type.

(See Italian Official)

CASUALTIES

ROYAL FLYING CORPS

Undated

KILLED

Cave, Second Lieut. E. A., R.F.C.

Barton, Second Lieut. Robert, R.F.C.

News has been received that Second Lieut. Robert Barton, R.F.C., has been killed during a reconnaissance over the German lines. A message was dropped from a German aeroplane over the British lines on January 30, stating that the officer was killed in an air duel with two Fokker machines, and had been buried with military honours at Roubaix, France. Lieut. Barton was the only son of Mr. Barton, of Red Court, Carnforth.

(Second Lieut. R. Barton was notified as "unofficially reported killed" on February 3.)

WOUNDED

February 11

Faber, Second Lieut. C., R.F.C.

PREVIOUSLY OFFICIALLY REPORTED MISSING, NOW UNOFFICIALLY REPORTED KILLED

Wilkinson, Lieut. E. S., London Regt. (T.F.), 1st Bn. (Royal Fusiliers) and R.F.C.

Egypt

KILLED

February 15

Hakewill, Second Lieut. T. G., R.F.C.

Yates, Second Lieut. R., R.F.C.

UNOFFICIALLY REPORTED KILLED

The following notice appeared in the obituary columns of the *Morning Post* of February 18:—

Brooking.—On January 19th, 1916, Second Lieut. W. A. Brooking, R.F.A. and R.F.C., aged 18 years 7 months, killed in action, the only beloved son of Brig.-Gen. H. T. Brooking, C.B., now serving in Mesopotamia, and Mrs. H. T. Brooking, India.

FATAL ACCIDENT AT BROOKLANDS.—A pupil named Ratcliff on February 20 was circling the aerodrome at Brooklands on a Farman biplane when the machine side-slipped for about 200 ft., and fell on a cottage just outside the ground. The petrol tank caught fire, the flames leaping up about 50 ft. Mr. Ratcliff was fatally injured, and some damage was done by fire to the cottage.

PROGRESS AT THE FLYING SCHOOLS

The London and Provincial School.—Instructors: W. T. Warren, M. G. Smiles, C. M. Jacques, H. Sykes, and W. T. Warren, jun. Pupils doing rolling: Hay and Egelstaff. Pupils doing straights: Clement, Palethorpe, and Scott. The Royal Aero Club Certificate was taken on the 13th inst. by C. J. W. Darwin, who passed the tests exceptionally well.

The Hall School.—During the last week the following pupils were receiving tuition with Anstey Chave: Longton, Mahoney, and Worswick. With Jack Drew: Millburn, Neal, and Roberts. With C. M. Hill: Lient. Cooke, Omcrod, Arnsby, Doods, Wooley, Smith, Cook, and Thom. With H. F. Stevens: Redford, Ridley, Nicolle, and Evans. Ridley flew for his certificate on Sunday and passed all the tests in excellent style. Machines in use: Hall tractor biplanes.

HONOURS FOR THE R.N.A.S.

The *London Gazette* of February 15 states:—"The King has been pleased to give and grant unto Engineer Lieut.-Commander Wilfred Briggs, R.N., Acting Squadron Commander in the Royal Naval Air Service, His Majesty's Royal licence and authority to wear the Cross of Chevalier of the Legion of Honour, which decoration has been conferred upon him by the President of the French Republic, in recognition of valuable services rendered by him."

SOCIETY OF MOTOR-MANUFACTURERS AND TRADERS.

A meeting of the Aero Committee of the above Society was held on January 27, when there were present: Mr. White Smith (in the chair), and Messrs. L. Coatalen, F. R. Simms, G. Holt-Thomas, and H. T. Wright. In attendance, the Secretary.

Controlled Firms and Excess Profits.—The Chairman explained the circumstances in which he had been added to the Special Committee and now enquired if he should act there on behalf of this Section. It was resolved that the Chairman should represent the Section accordingly, but that having regard to the unique position of the aeroplane industry, the Special Committee should expressly exclude representations on behalf of this Section, which should be free to make its own. Consideration was then given to the position of the Section under the Finance Act, and a sub-committee, consisting of the Chairman, Mr. Carey and Mr. Holt-Thomas, was appointed to approach the Treasury.

Railway Rates.—The Chairman reported on the proceedings at the Board of Trade conference with the railway companies, and Mr. Carey stated that the latter, as arranged, had called to inspect their methods of packing. No decision had yet, however, been received as to rates.

Council Representation.—The position of this Section with regard to the Council and Management Committee was reviewed. The question of ordinary membership qualification was discussed in this connection. It was resolved to place the whole subject on the next agenda, and to issue a statement of the position for consideration at that meeting.

COMPANY NEWS.

Aeroplane Construction Co., Ltd.—Meeting to receive liquidator's report, March 15, at 3, Central Buildings, Westminster, S.W.

Hele-Shaw Patent Clutch Co., Ltd.—Meeting to receive liquidator's report, March 8, at Hartford Works, Oldham.

Mayro-Wing Aviation Co. (J. J. Mayrow, trading as), 82a, Lillie Road, Fulham, S.W.—Adjudication, February 9.

AERONAUTICS

A WEEKLY JOURNAL DEVOTED TO THE TECHNIQUE OF AERONAUTICS

(FOUNDED 1907)

Edited by JOHN H. LEDEBOER, B.A., A.F.Ae.S.

VOL. X. No. 124 (NEW SERIES)

MARCH 1, 1916

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ONE PENNY

THE PERPETUATION OF THE MUDDLE

AFTER all, our own interests must form our primary consideration. True, the fate of our Allies, more especially along the Western front, is closely bound up with our own, and will be so in ever-increasing measure as the war proceeds; on the other hand, we have no precise knowledge of their designs or of their resources, or, an' we had, are we entitled to voice them. Rather must we for the moment content ourselves with our own internal affairs. Last week I promised to formulate a complete programme of progressive reform in the constitution and reorganisation of our air services. Circumstances have arisen which render it undesirable that this should be done at the present time. Accordingly, this constructive scheme must perforce be postponed—at any rate for this week.

But since the appearance of our last issue one announcement has been made public which not only deeply affects the future of the air services, but sheds a lurid and singularly misleading light on the Government's scheme of so-called reorganisation. As previously reported in our columns, during the House of Commons debate Mr. Tennant gave vent to the following portentous announcement, obviously designed to apply soothing balm to the irritated nerves of his critics and to the unrestful frame of mind of the populace in general, who, it may seem strange to relate, emphatically do not like to have the members of their family killed or maimed in their beds or see their property destroyed before their eyes. Let us reproduce the official statement. See how it runs:

A Standing Joint Naval and Military Committee will be formed to co-ordinate questions of supply and design of material for the two air services.

And on the following day, in the House of Lords, the Secretary for War gave the following version:

But as flying machines, like artillery, are an adjunct of both Navy and Army, it has been found advisable to co-ordinate the supply of engines and machines by the establishment of a sub-committee of the Committee of Imperial Defence to deal with the relative requirements of the two services.

May we gather, then, that this hybrid committee is actually intended to be yet another of the multitudinous sub-committees of the Committee of Imperial Defence? How trippingly, how politically, now nepotistically it all sounds! Agreed that we want to co-ordinate (and, above all, to increase) our supply of engines and machines. But two questions first: Is this goodly new-fangled committee likely to achieve the desired result?

Government, whom popular clamour, however ill-judged and ill-directed, has forced into an awkward corner, burks the entire question by appointing to the headship of its precious foundling no less a person than Lord Derby, a person who, as our contemporary the *Times* appositely remarked, "has become a name to conjure with when the

Government are in difficulties, and fears are expressed that on this occasion the Cabinet are thinking more of shielding themselves from criticism than of 'getting things done.' The work of co-ordinating the air services [the official statements studiously avoided this point and only referred to the supply of material] demands the whole time and energy of a strong man, with sufficient general knowledge to stand up to competing experts, and sufficient driving-power to make up for much lost time."

As we stand in hearty agreement with this view of the matter, we may fairly ask whether Lord Derby possesses sufficient "general knowledge" of the subject, and whether the whole arrangement is not one designed at once to shield the Government from awkward criticism and to perpetuate the existing scheme of political control and the consequent inefficiency of the air services; and, believe me, no one labours more grievously under the defects of the present system than the average member of one or other of the flying services, or would more dearly love to see it destroyed root and branch. Lord Derby may be a capable organiser—on this point I would not dare venture an opinion which, in any case, would be valueless—but even so his appointment to the presidency of the committee in question, which demands, above all, technical knowledge of an exceptionally recondite and extensive order, apart from executive ability, could only be justified if his coadjutors were men generally acknowledged to be experts in the full sense of the word. And such, there is only too grave reason to fear, is not to be the case.

Briefly, and I may be forgiven for harping on the fact, the conduct of the war, and of the aerial war in particular since it is essentially a question of technical knowledge, must be radically divorced both from political taint and from amateurish interference. War is at once a scourge and a cleanser; it constitutes a Turkish bath for the soul and expels much extraneous and impure matter which otherwise is apt to clog up the pores of the organism. Those in the know, those in actual touch with the primary facts of the case and with the working of the machine in practice, have already witnessed this process in operation. They may be well excused for deeming this latest development the last specious attempt to reduce the conduct of the air services to the former inefficient system of control.

Criticism, if it is to be effective, should be prepared to supply a remedy for the abuses at which it is levelled. So here. For reasons already stated, I am compelled to refrain from expounding a detailed scheme; but the following reforms I will lay down as essential: reform, total reorganisation of the present inspection departments and their co-ordination under a single responsible directing and executive head; standardisation of design and parts as between the various branches of the air service; unification of aerodrome

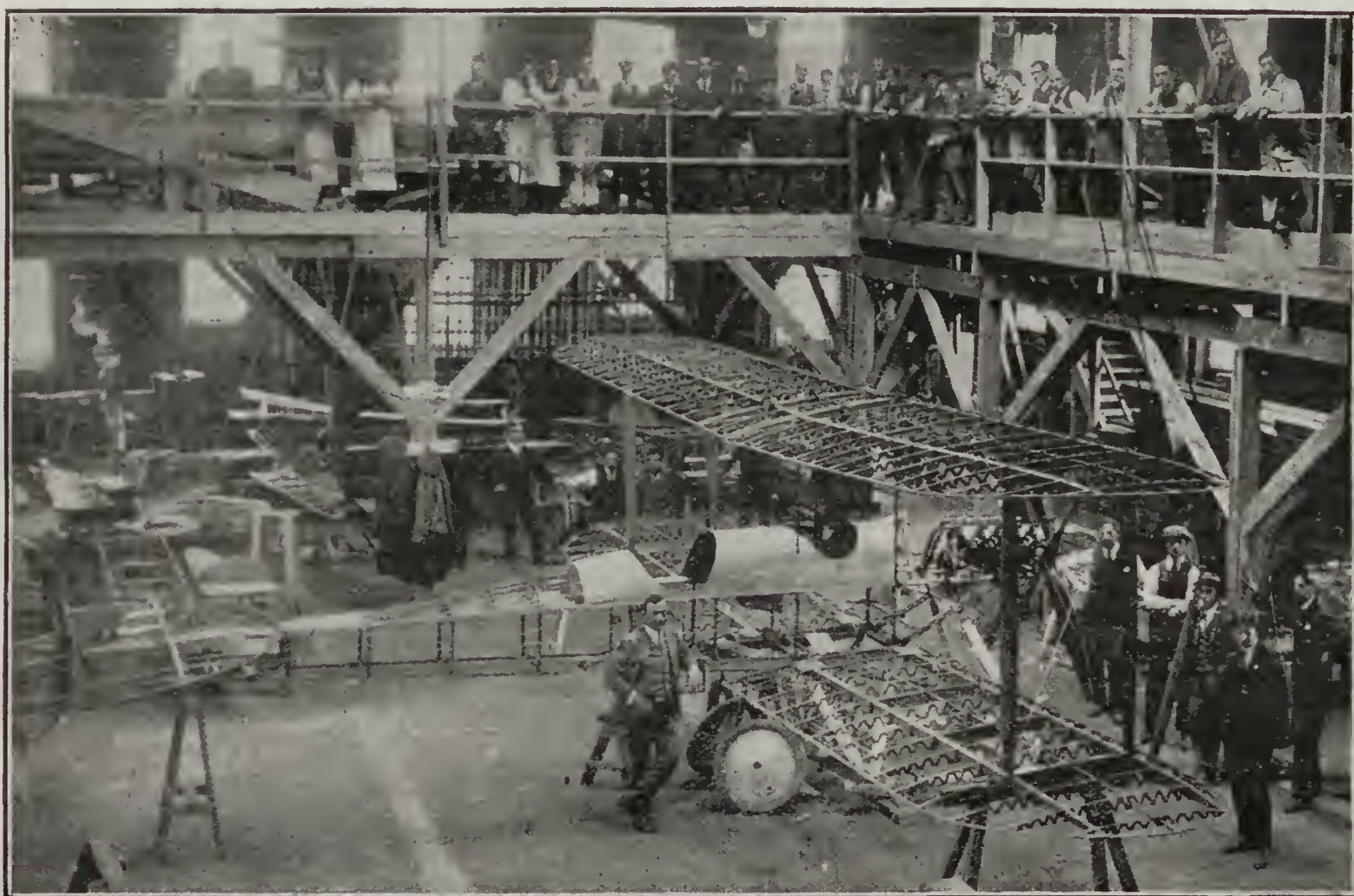
control and management throughout the country and standardisation of tuition methods; closer co-operation between the home aerial organisation and that in full working order abroad, since, all said and done, the former constitutes the reserve of the latter and serves as the one source of its replenishment in material and in men.

In connection with the present vital campaign, one or two considerations are to be noted. One contention of the prophets would appear to have been falsified. They maintained that the advent of the aeroplane and its utilisation in sufficient numbers and with adequate skill would for ever render strategic surprise in warfare impossible. But in operations on a vast scale, such as we are witnessing to-day, this view has proved groundless, and for two reasons—the impossibility of effectively patrolling the far-flung front line and the regions in its rear (not to mention the movements of troop trains and supply columns), and the possibility, by the judicious massing of aeroplane squadrons in a certain region, of driving the enemy out of the air. A modern battle, or a great strategic move preluding an attack in force, is invariably pre-

pared by increased aerial activity on the part of the attackers. Thus were rendered possible the successes at Neuve Chapelle, at Loos, and in Champagne—only partial, it is true, but this was no fault of the aviators, who nobly did their part—and of Mackensen's great offensive in Galicia.

But the present great German offensive is an even more signal case in point. From the vast increase in German aerial activity—of an offensive rather than a purely defensive nature—I came to, and stated, the conclusion, a week or two ago, that the threatened German attack on a grand scale would materialise before many days were over. Events have now borne out the forecast, which is not so much meritorious as founded on common sense. Well, we have done our share in common with our Allies in countering the aerial menace in the air. More, the signs portend that we have regained the whip-hand. So far so good. But omens are not wanting also that the Hun is about to risk his fate on the waters of the North Sea. Here he has the clear advantage in long-range scouting. Are we prepared to meet him in this respect also?

J. H. L.



INTERIOR OF THE WHITEHEAD WORKS

WHITEHEAD AIRCRAFT WORKS

THE Whitehead Aircraft Co., of Richmond, Surrey, are developing very rapidly. It is only a few months ago that Mr. J. A. Whitehead started the present factory, but his planes have already been flying some time now, and the business has developed to such an extent that it has outgrown the present building.

On Wednesday, February 23, the first sod was turned for the new factory, which is so necessary in order to cope with the orders coming in. A very suitable piece of land was secured for this purpose by Mr. Whitehead, and it has the additional advantage of being quite near the present factory, as well as alongside the railway line.

In the "old" factory (the adjective will soon be required, although the factory has not yet celebrated its first anniversary as an aeroplane works) the space is being utilised

up to the last foot; in fact, it is nothing but a triumph of organisation which enables so much work to be done and so many persons to be employed there.

An excellent spirit exists. Mr. Whitehead knows and appreciates the old adage about "all work and no play," and his natural gift for getting on well with people is reflected in the tone of his factory.

He has instituted a series of little free and easy concerts for the employees. Two of these have already been given. The employees themselves take a keen delight in contributing to the programme, and the vocal items by Mr. Whitehead himself have been appreciated as much as anything in the programme.

The growth of the firm is very striking, and the commencement of an additional factory marks another step in a career that is giving every evidence of doing credit to the aviation industry.

DESTRUCTION OF A ZEPPELIN AND MANY AEROPLANES

THE events of last week may well give pause to those who have lately dismally proclaimed that the Germans have gained the mastery of the air. As we have repeatedly pointed out, a sudden outburst of aerial activity forms the inevitable prelude in modern war of any offensive movement on a large scale, and this partly for purposes of reconnaissance, partly to drive off the enemy's aircraft, and partly to interfere as much as possible with the enemy's lines of communications by bombing vital points. We knew that the German offensive was close at hand; only by cleverly dispersing his raids along the whole front the Germans sought to leave us in doubt regarding the precise locality of the attack. But by Sunday all doubt was at an end, and

dedented activity. For the first time the Huns resolutely ventured to cross our lines in numbers, on bombing and reconnaissance intent, for the disposition of the main French reserves had to be definitely located and their concentration hampered as far as possible. Accordingly raiding squadrons presented themselves over Dixmude, Dunkirk, Poperinghe, Baillent, Hazebrouck, Amiens, Compiègne, Soissons, Bétheny, Châlons, Révigny, Bar-le-Duc, Nancy, Lunéville, and Gray, thus covering the whole stretch of the front from end to end. But not with impunity, as the following list of their losses shows:—February 21: Fokker brought down after combat at Altkirch, in Alsace; Albatros brought down by artillery near Epinal; near Bures German acro-



ROUGH SKETCH MAP ILLUSTRATING RECENT AERIAL ACTIVITIES IN LORRAINE

we knew that Lorraine was to be the scene of the great attack.

The most noteworthy success on the Allies' side was the destruction of the Zeppelin LZ77 near Révigny, during the evening of Monday, February 21. Coming from the direction of St. Ménehould (see sketch map), it was picked out by the French mobile searchlights, flying south at an altitude of some 5,000 ft. at 8.30 p.m. A French mobile battery of two motor-driven 75 mm. guns opened fire with incendiary shell; the fourth shot hit the airship fair amidships and set it on fire. The conflagration was rapid and intense, and the wreck of the dirigible fell near the village of Brabant-le-Roi, a few miles north of Révigny. Twenty-two corpses have been discovered among the wreckage, including that of a volunteer lieutenant who jumped clear and, though not burned, was killed on the spot. The crew threw out the whole cargo of bombs the moment the craft caught fire. A second convoying Zeppelin turned tail and escaped undamaged. Without laying too much stress on the destruction of this modern craft, we may yet pay our tribute to the skill of the French gunners and to Adjutant Gramling and Private Pennetier, who fired the shots in question.

Meanwhile the German aeroplanes had shown unprece-

plane, attacked by French machines, shot down and both occupants killed; near Givry, one Hun machine shot down behind French lines and another nose-dived behind German lines (total bag, five Huns in one day). Our offensive was equally successful: English raids on Lille and Cambrai, French raids on Metz, Pagny, Conflans, Etain and Mulhouse. So the balance may be fairly struck in our favour along the Western front.

February 22—The New Zeppelin—A correspondent of *The Times*, writing from The Hague, states that a neutral recently returned from Berlin, asked as to Zeppelin activity, replied that the new "Spitzende" Zeppelin (pointed at each end) was swiftly manoeuvring over Berlin last week either for practice or for demonstration before the people. Everywhere is Zeppelin talk. There is unusual activity at Johannisthal, the aeronautical headquarters near Berlin, and aeroplanes are practising everywhere, especially in the Döberitz district. The poorer classes have unlimited faith in the air warfare, and believe that eventually the Germans will be able to land large bodies of troops in England by this means. Councillor Rudolf Martin issued some time ago some foolish notes on this project. The fire-eaters are not now so numerous as they were in circles of this kind a year ago. Then they were all talking of a chain of submarines which would throttle John Bull and of Zeppelins that would set fire to the Bank of England and Buckingham Palace. To-day there are thousands who question whether the use of submarines and Zeppelins may not cause England to tighten the blockade and thus deprive the soldiers of the necessities which are reaching them through the leakages.

PROGRESS OF AMERICAN AVIATION

By E. LARUE JONES, American Editor

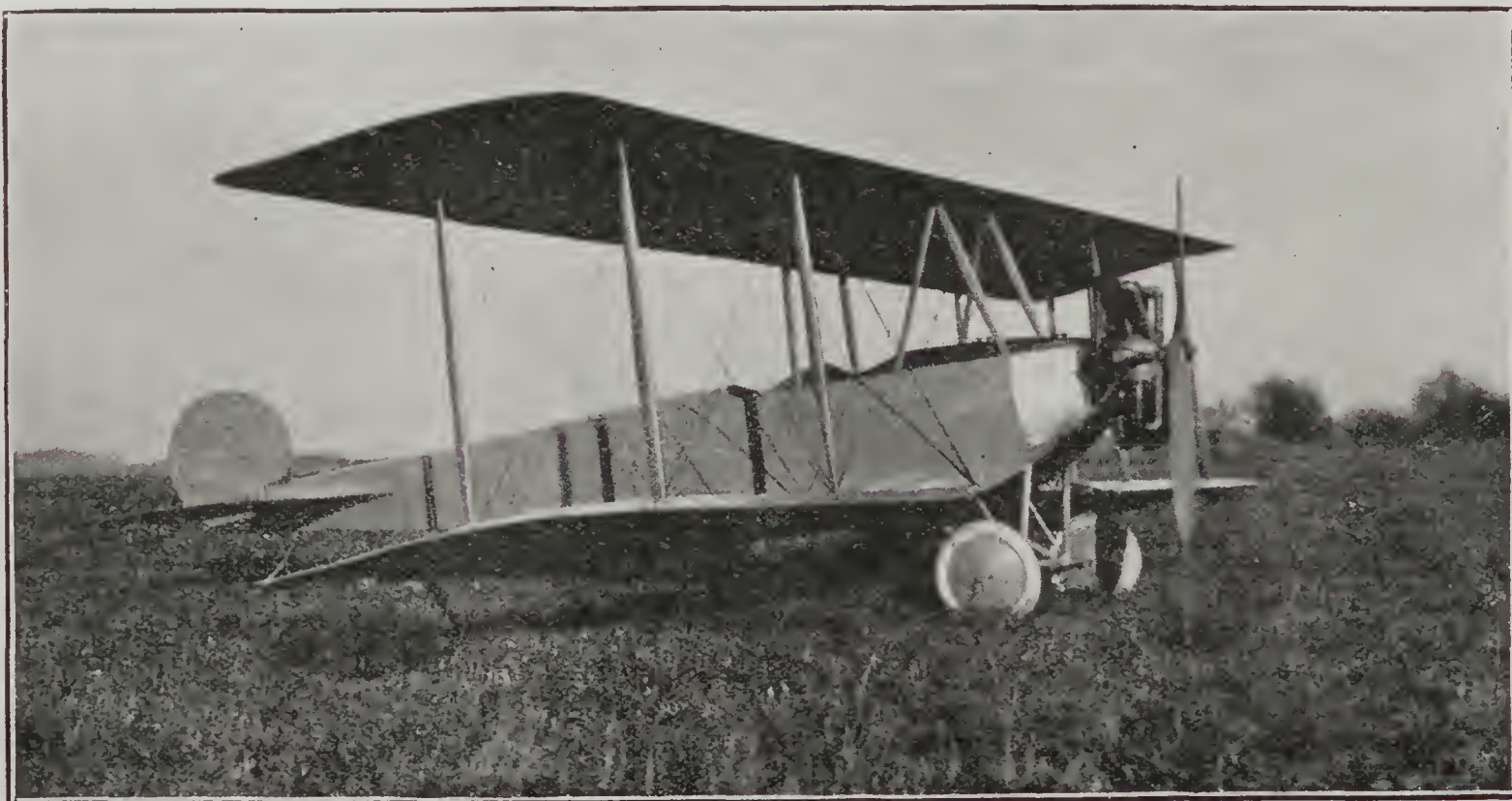
THE GRINNELL AEROPLANE

AIR bugs on the Atlantic and Pacific coasts seem to think that all the aviation there is is local. Grinnell, out in Iowa, asks for its place in the sun with the Grinnell aeroplane, designed by W. C. Robinson, who still holds the American non-stop cross-country record of 332 miles, official, made October 17, 1914, with the Grinnell monoplane and the Robinson motor. This was the first real trial of an experimental motor, and in this flight, from Des Moines, Ia., to Kentland, Ind., it was up 4 hours 44 minutes and used 45 gallons of petrol and 7 gallons of oil, which was fed rather fast in order to be absolutely safe with a new engine.

The Grinnell machine is designed to be readily changeable from monoplane to biplane and vice versa. The biplane wings quickly detach, and the monoplane wings go on with merely a substitution of struts, as will be seen from the photographs of the biplane and the monoplane, and the use of the steel pyramid for the upper guying of the mono wings.

The control is the Dep, which is the universal control used abroad. The oil and petrol is fed by gravity to the engine from tank to its rear. Two passengers may sit by side, and the pilot in their rear in a single seat.

The elevator and rudder framing arrangement is novel, in America at least. The framing of the fuselage, which is covered in, is tapered to a sharp edge at the rear—the last few feet of the fuselage being made up of steel tubing welded, into which the longitudinal fuselage spars slip. The forward spar of the twin elevators goes into the tube seen in the picture, and the arms also noted clamp to the inside fore-and-aft spars of the elevators. The fixed surface attaches at the rear edge to the cross tubes, as shown in the small picture. The vertical tube comprising the extremity of the fuselage contains the rudder post. The ribs are nicely made. Both upper and lower members are of "T" section, and spacer blocks are slotted to receive the vertical part of the "T." These are glued and tacked with brads.



THE GRINNELL AEROPLANE

The under guys fasten to the fuselage at points arranged for. As a monoplane, the machine weighs 900 lb. empty, and will carry 700 lb. load. In the cross-country flight mentioned 600 lb. of pilot and fuel were carried at over 80 m.p.h. On another occasion it climbed 10,000 ft. in thirty minutes with two up. The monoplane spreads 36 ft., 7 ft. chord, and wing curve similar to that of the biplane (weight per square foot, 6 lb.).

The dimensions of the biplane may be noted. This is a three-man tractor, flying at 75 m.p.h. with two aboard. However, no official speed test has ever been made. Empty, the machine weighs 1,100 lb., and will carry 1,000 lb. more in passengers and fuel. The machine spreads 37 ft. 6 in. and the chord is 6 ft., giving 450 sq. ft. of main supporting surfaces. The power is a 100 h.p. six-cylinder radial engine, cylinders 5 by 6 inches. It turns an 8.5 ft. diameter by 6 ft. pitch propeller at 1,400 in the air. A full description of the motor, with detail pictures, will be given later.

Ailerons are cut out of the upper and lower wings and work in combination by a steel cable between the upper and lower ones. The hinged edge is made up of a steel tube, to which the wooden ribs are attached.

U.S. SIGNAL CORPS

SAN DIEGO, CAL., January 31, 1916.

THE flying records of the Signal Corps Aviation School for 1915 present a number of interesting features. There were 1,626 passengers carried, and a total of 3,652 flights made, with a duration of 1,516 hrs. 19 m. in the air. A conservative estimate gives a total distance of over 95,000 miles covered by army machines at the school during the year. There was but one accident attended with fatal results. The other accidents were of a minor nature, none of which resulted in injury to the pilot or in the complete wrecking of a machine. These included the breaking of a wing by contact with the ground, broken propellers, broken wheels, or other parts of the landing gear. There was an average of seven machines in commission each month during the year.

The First Company, Second Aero Squadron, left the School January 2, sailing for the Philippines from San Francisco, January 5, on the transport *Sheridan*. Two of the large Martin Model S seaplanes for this company did not pass their acceptance tests in time to be sent with the company. They have since been tuned up, tested and accepted, and are now being sent on the February 5 trans-

port. First Lieutenant Shepler W. FitzGerald, who practised with the machines after their acceptance, will sail on the same transport.

Although there was little flying during the Christmas holidays, 427 flights were made during December; duration 187 hours 48 minutes; 167 passengers carried. During the month of January Lieutenants Curry, Brown, Richards, and Royce, and Sergeant Adamson and Corporal Biffle passed their tests for pilot's license. The above officers will probably be given their junior military aviator tests about March 1.

Two classes of six officers each completed their course in practical motor work under Mr. Hallett, February 5, and another class of six officers started in this course, February 7. The first course in aeronautical engineering for the new year is scheduled to begin February 7, with Captain Clark as instructor. Seventeen student officers will take this course.

U.S. NAVY MAY HAVE CIVILIAN FLYERS

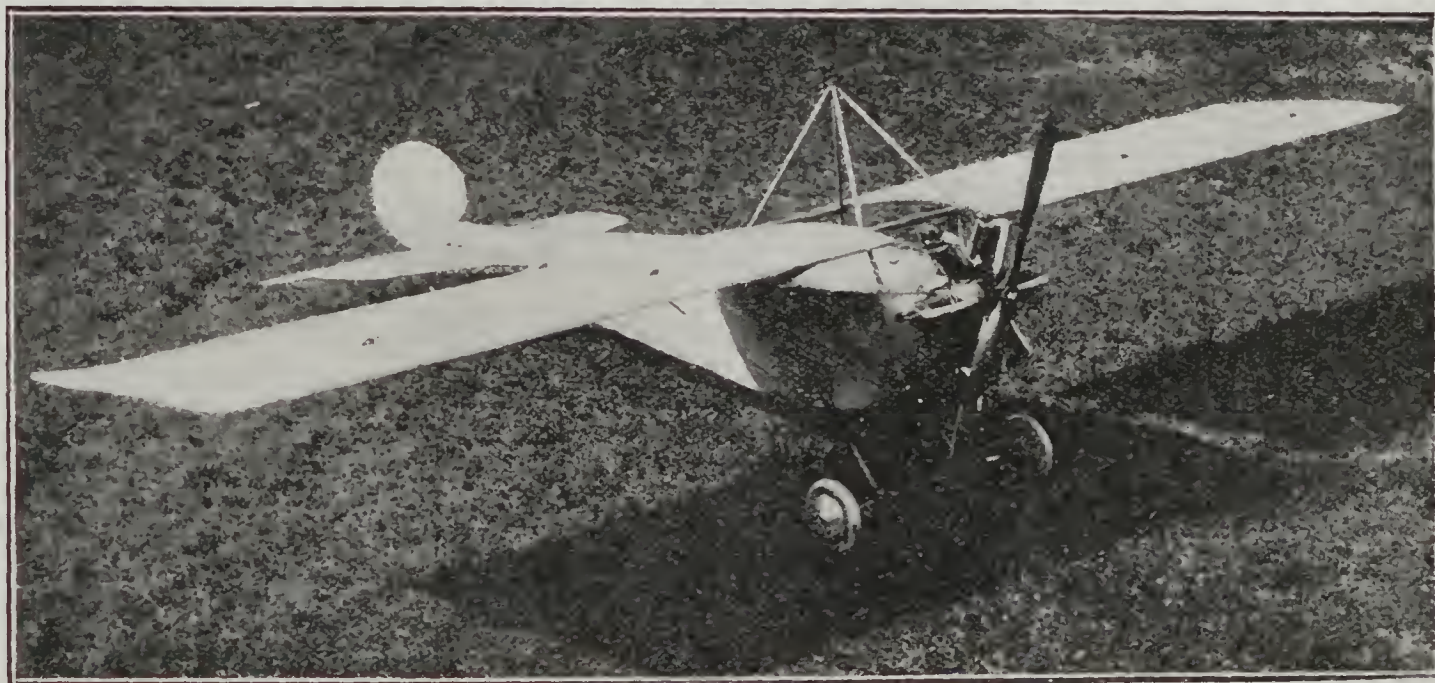
THE Committee on Naval Affairs of the House of Representatives has passed favourably on Bill H.R. 9,224, providing for an increase in the number of midshipmen in the U.S. Naval Academy.

Secretary of the Navy Daniels recommends in this Bill

plete with Tail and Rudder, but without Wings, Struts, or Propeller," by J. C. Hunsaker and D. W. Douglas; "Swept Back Wings," by H. E. Rossell and C. L. Brand; "Experiments on a Dihedral Angle Wing," by J. C. Hunsaker and D. W. Douglas; "Critical Speeds for Flat Discs in a Normal Wind," by J. C. Hunsaker, with prefatory note by E. B. Wilson, Professor of Mathematics, M.I.T. This work is free to applicants.

THE 1,000 H.P. CURTISS FLYING BOAT

THE new big 250 h.p. engines for the 1000 h.p. triplane flying boat, which we are all so anxiously waiting to see float out of the Curtiss plant, were well under way the last week in January. These will be 12-cylinder engines, cylinders 5 in. by 7 in. bore and stroke, arranged in Vee form, 60 deg., of course. These will be tested in the two new Sprague electric dynamometers to be installed, which are capable of handling two engines at once. It is of interest to note that recent tests of the 160 h.p. motor, with eight cylinders 5 in. by 7 in., showed more than 160 h.p. on a test of several hours. The dynamometer was rated to handle only about 80 h.p. at 1200 r.p.m., but it did show more than 160 for these engines—an overload on the dynamometer of 100 per cent. Blowers were arranged so that they kept parts of the electrical apparatus cool.



GRINNELL MACHINE AS A MONOPLANE

an increase in appointments by 531, and plans to draw officers from civil life for aviation duties. "In aviation there are strong reasons for opening the door to civilian experts. In Europe the most expert aviators have been drawn from civilian flyers."

NEW SMITHSONIAN REPORT

A NEW volume has been issued by the Smithsonian Institution, Washington, D.C., entitled "Reports on Wind Tunnel Experiments in Aerodynamics." The contents include:—"The Wind Tunnel of the Massachusetts Institute of Technology," by J. C. Hunsaker, Assistant Naval Constructor; "Notes on the Dimensional Theory of Wind Tunnel Experiments," by E. Buckingham, U.S. Bureau of Standards; "The Pitot Tube and Inclined Manometer," by J. C. Hunsaker; "Adjustment of Velocity Gradient Across a Section of the Wind Tunnel," by H. E. Rossell, Assistant Naval Constructor, U.S.N., and D. W. Douglas, S.B.; "Characteristic Curves for Wing Section, R.A.F. 6," by H. E. Rossell, D. W. Douglas, and C. L. Brand, Assistant Naval Constructor; "Stability of Steering of a Dirigible," by J. C. Hunsaker; "Pitching and Yawing Moments on Model of Curtiss Aeroplane Chassis and Fuselage, com-

WORLD RECORD FOR TWO MEN IN SEAPLANE

ON January 13 Sergeant Ocker climbed 5,000 feet in 10 minutes 6 seconds in a school training machine equipped with a propeller designed and constructed at the School especially for climbing. On the same day, in the duration test of one of the large Martin seaplanes, Mr. Floyd B. Smith, as pilot, with Mr. Donald Douglas as passenger (both of the Glenn L. Martin Aeroplane Company), reached an altitude of 12,372 feet. This is a world's record for seaplane for pilot and one passenger. There are twenty-three student officers and seven non-commissioned officers undergoing instruction in flying at the present time. During January the following officers started flying alone:—Second Lieutenants George H. Brett, Sheldon H. Wheeler, and George E. A. Reinburg. During the same month Second Lieutenants John W. Butts, Leo G. Heffernan, John C. P. Bartholf, Clinton W. Russell, Howard C. Davidson, and Maxwell Kirby reported at the Signal Corps Aviation School for duty as aviation students.

The heavy rain storms during the past month have seriously interfered with flying. There has been no connection by rail between San Diego and the rest of the world since

January 17, and the damage caused by the storm of January 27 will tie up the railroad for several weeks more. During this month there have been but sixteen flying days. In spite of these adverse conditions, 138 flights were made, with a duration of 54 hours 7 minutes.

PENSACOLA, FLA., JAN. 15, 1916

The weather conditions were poor for flying during the week ending January 15 at the Navy Aeronautic Station, Pensacola. In spite of this 31 hours and 20 minutes with 1,818 miles of flight were accomplished. Lieuts. G. D. Murray and H. W. Scofield made a scouting flight of 60 minutes duration across the Gulf of Mexico in aeroplane AH-10, the destroyers *Sterrett* and *Perkins* co-operating. A 30-mile south wind was blowing. At the erecting shop has begun the rebuilding of the AH-8 and AH-12, and the rebuilding of AB-3 is about completed. When ready, it will be turned over to the flying school. The new aeroplane AH-16 has been turned over to the flying school. This aeroplane was received from the Curtiss Company a short time ago.

FEBRUARY 5, 1916

Weather conditions last week restricted flying at the Navy Aeronautic Station, but a total for the week of 24 hours 30 minutes, or the equivalent of 1,421 miles of direct flight, was accomplished. One new Wright hydro-aeroplane, 60 h.p., twin-screw tractor, has arrived at the station and is being assembled. Roy Knabenshue, Walter Brookins and Charles Nellis, of the Wright Co., have arrived at the station on business in connection with its assembly, test, and demonstration. On Wednesday of last

SLOANE MANUFACTURING CO

Holderman von Figyelmessy, the well-known exhibition flyer, has placed an order for a type "M" 90 h.p. tractor biplane. This machine will contain many of the features that made the performance of type "H" so remarkable. The speed variation of this outfit will be from 35 to 75 miles per hour. It will carry pilot and passenger, and can be equipped as a seaplane. "T" Sloane standard four-wheeled landing gear will be supplied.

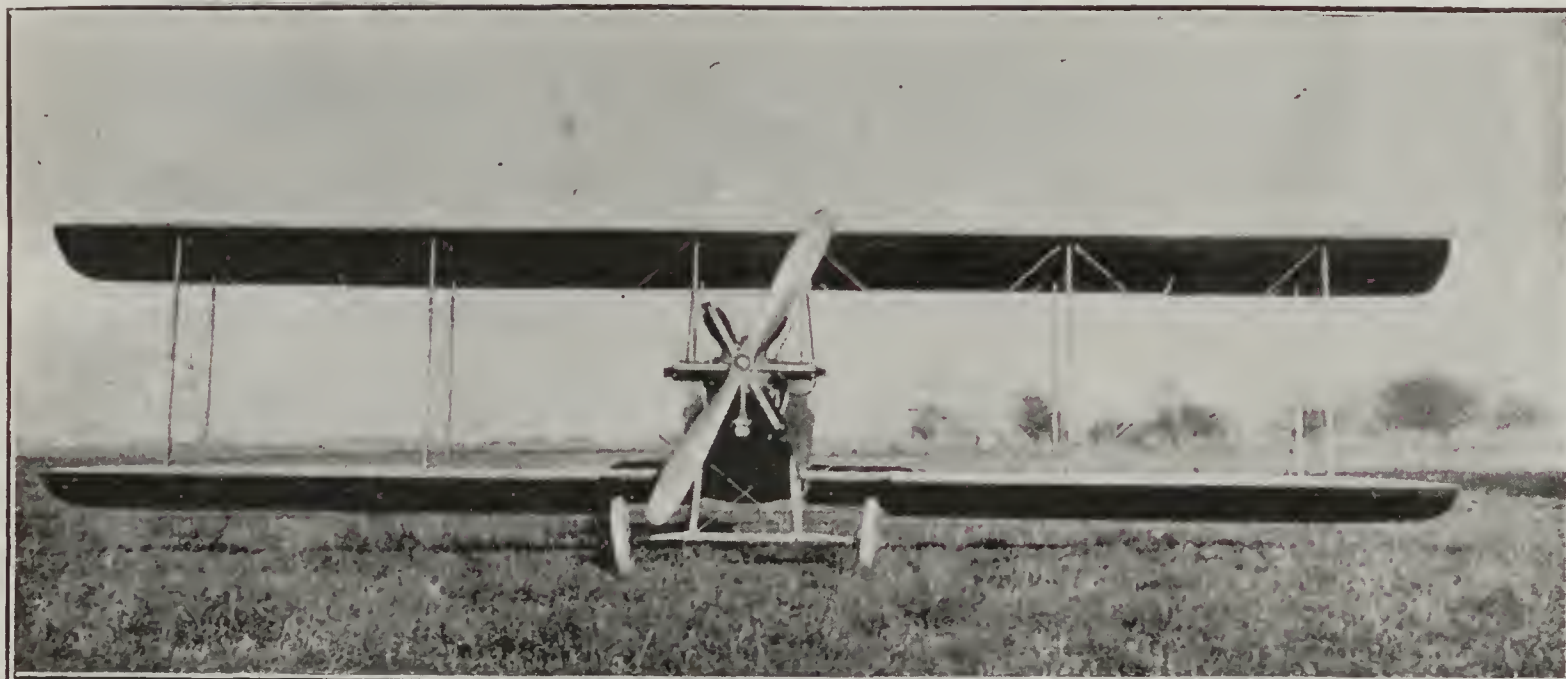
The 125-h.p. military tractor Sloane-Day biplanes being turned out at the Plainfield factory are all guaranteed to exceed 90 m.p.h. with full load. These, like type "H" machines, will be the fastest of their class in America and will be the only American machine to give this performance with the same load and equipment. Motors are being received weekly and the production is proceeding very satisfactorily.

WORLD'S RECORD BROKEN

On the morning of Wednesday, January 12, Chief Pilot J. Floyd Smith, accompanied by Donald W. Douglas, chief engineer of the Glenn L. Martin Company, broke the world's altitude record for a seaplane with passenger by ascending 12,362 feet in the new Martin seaplane, Model "S."

Starting out with 600 lbs. useful load aboard, the contracted climb of 3,000 feet in ten minutes was first made. Continuing on up in spite of the extreme cold, Smith reached his highest point in 1½ hours. The intense cold cooled the motor down to 100 degrees, but for which fact a higher level might have been attained.

On returning to the hangars measurements were made, and it was found that there was still 140 lbs. of fuel and oil aboard. The same



FRONT VIEW OF THE GRINNELL BIPLANE

week the city of Pensacola celebrated the opening of the new Gulf, Florida and Alabama Railroad. A marching battalion from the *North Carolina* participated in the parade, during the progress of which five aeroplanes from the aeronautic station flew above Pensacola at altitudes ranging from 3,000 to 8,000 ft., and in the afternoon all the available machines made exhibition flights around the Tallapoosa. On Thursday the G.F. and A. party visited the station and inspected the various shops and buildings.

THOMAS NEWS

In a new Thomas military tractor biplane, type D-2, Aviator Frank Burnside has attained an average speed of 95 m.p.h., breaking all American records for speed.

The tests were conducted over a measured half-mile course on the field used by the Thomas School of Aviation. With a slight wind Mr. Burnside covered the one-half mile in 17 4/5 seconds. Against the wind he made one-half mile in 20 1/5 seconds. His average speed was 38 seconds for one mile. In one of the flights he made the half mile in 17 1/2 seconds, and with the wind cut through the air at 102 1/2 miles per hour.

These flights were officially timed by Mr. J. J. Frawley, who is a representative of the Aero Club of America, and a record of this remarkable performance has been sent to the New York headquarters of this organization.

This machine is equipped with a Thomas Model 8 135-h.p. "V" type aeromotor, and is constructed for weight-lifting and climbing as well as for speed.

The flights are being conducted on the aviation field almost daily, and a number of the foreign Government representatives have signified their intention of coming to Ithaca to witness the tests.

altitude might therefore have been reached with a second passenger aboard in place of the excess fuel.

The new seaplane, which is the first of four to be delivered to the U.S. army, exceeded the specified speed range of 42 to 71 1/2 miles per hour by actually making 40 to 75 miles per hour with full load aboard.

GENERAL DIMENSIONS

Top span ..	..	..	..	51 ft. 8 in.
Bottom span ..	..	..	..	Same
Length over all ..	..	..	..	28 ft.
Fuel capacity ..	..	..	..	70 gallons
Climbing speed ..	..	..	..	3,000 ft. in 10 minutes
Gliding angle ..	..	..	..	15 to 1
Useful load ..	..	..	..	800 lb.
Air speed (loaded) ..	..	..	..	40 to 75 miles.
Weight of machine ..	..	..	..	2,200 lb.
Motor and h.p. ..	..	..	..	Hall-Scott "Six" 125 h.p.
Control ..	..	..	..	3 in 1
Types, Model "S," either land or water chassis.				

(Signed) GLENN L. MARTIN COMPANY,
Los Angeles, California.

A hydro-aeroplane of the pontoon type is the latest substantial contribution to the National Aeroplane Fund, which was instituted six months ago by the Aero Club of America for the purpose of developing aviation corps in the Militia of all the States, and which has already resulted in the Militia of 24 States taking up aviation.

RANDOM REMARKS

XXXVIII.—MONEY

By ARTHUR LAWRENCE

IT may be thought by my friends that I have little title to write on this subject. Well, I don't know. I've had my ups and downs. I have been uppish. I have toddled along with Lord Rosebery whilst Asquith and others desired to interview him, and I have been in such a parlous state that no man would venture to get on closer terms with me than the weather. I have swatted away so that my income for the year has been



EDITORIAL ECONOMY

well on the four figures — and the income tax fully paid, or I should not make the admission—and in a subsequent year I have known what it is to live all day on a doughnut. Doughnuts increase by absorption. Likewise I have put some bread on the back window-ledge for the birds in the morning, and in the evening I have called in the balance. Yes, I have been very uppish indeed, and I have been down enough so that I couldn't help grinning. I have drawn as big cheques as any fellow in Fleet Street. I have done little stunts which have been paid for at half a sovereign a word, and I have had fees which have been so insignificant that—well, well, let us make no further reference to these painful subjects.

Yet I am still undecided whether it is better to have a full purse or not. Out of funds—out of mischief. You may not have a host of boon companions, but you are also spared the infliction. At one time I have been afraid to walk down Fleet Street because of the number of bright lads who, in the words of the music-hall song, "could do with a bit," and, at another time, I have given my haunts a wide berth because of my suspicion that there were some dubious fellows lurking around who wanted to drop ugly missives into my pocket. Yet never have I displayed greater friendliness than when one of these jackals has greeted me with sinister servility. There is a joy in having a bit of money to spend, but there is the awful responsibility upon you as to how it ought to be spent. There is a joy in being without it, for the men you least thought of step forward to brighten your long afternoons. There is—or should be, I suppose—a joy in great possessions, although the Scriptures are dead against it.

The other day a friend's secretary told me that she had noticed one peculiarity in authors and journalists—they were always hard-up. I commiserated with her on not having met any of the large number who are really well off. Besides, some of us have small incomes because we pay for our freedom. We could earn a lot more, but we refuse to be tied to an office and put through our paces. At one moment we are

fighting with the wolf at the door, and at another we may be observed taking a comprehensive survey of the Universe, living the unfettered life on our grand reserve of cash and brains. In such an open profession there must needs be some very poor men, who would have done no better at anything else. But what of the stage? There you are either in a shop or jolly well out of it. As a scribbler you can always be doing a bit here or there; but on the stage it's either affluence or looking for friends. Even the law has its fringes. And, as a rule, the needy ones are not very cheerful over it, either. I remember exceptions. There was an old chap who regularly attended a low-roofed, saw-dusted hostelry near the Courts, who long before now must have been conveyanced away to his fathers. I nicknamed him "part-heard," as his oases were always in that predicament. He had fringe to his trousers, and, in the manner of Solomon Pell, was not proof against having his favourite liquid thrust upon him. His cases always involved a few millions, and I once overheard him remark: "And after all what is fifty pounds?" He carried his indigence nobly, and when my own pockets are empty I attempt to emulate the off-hand manner of that old fellow.

I have lunched with at least three millionaires, and, in every case, was left to settle the bill. With one doubtful exception, they did not seem to enjoy life very hugely, whilst I, with only a brace of bar-gold left to go on with, allowed them to take their hats off to me when we next met. If you dine with a millionaire at any place but his own home tell him that the food is rotten and that the wine is much worse. He won't know any better. Usually he has to confine himself to the waters from some German spring and a bit of dry toast. Moreover, in getting his money he has had no time to appreciate the romance of food. He has had no time to see the bright side of life. He is a food-bolter and a man without knowledge. Disguise a bottle of dry ginger wine and tell him it's a vintage champagne

and he will have to go away and hire experts before he will have the pluck to tell you that you are wrong. He is the overloaded camel who cannot get through the incommodious exit of ancient cities. I have hardly begun all that I wanted to say, but I learned from the "message" of the Manager of this journal last week that space is expensive and paper is dearer than his form of wit.



MANAGERIAL
EXTRAVAGANCE

MODEL AEROPLANES—XXVI

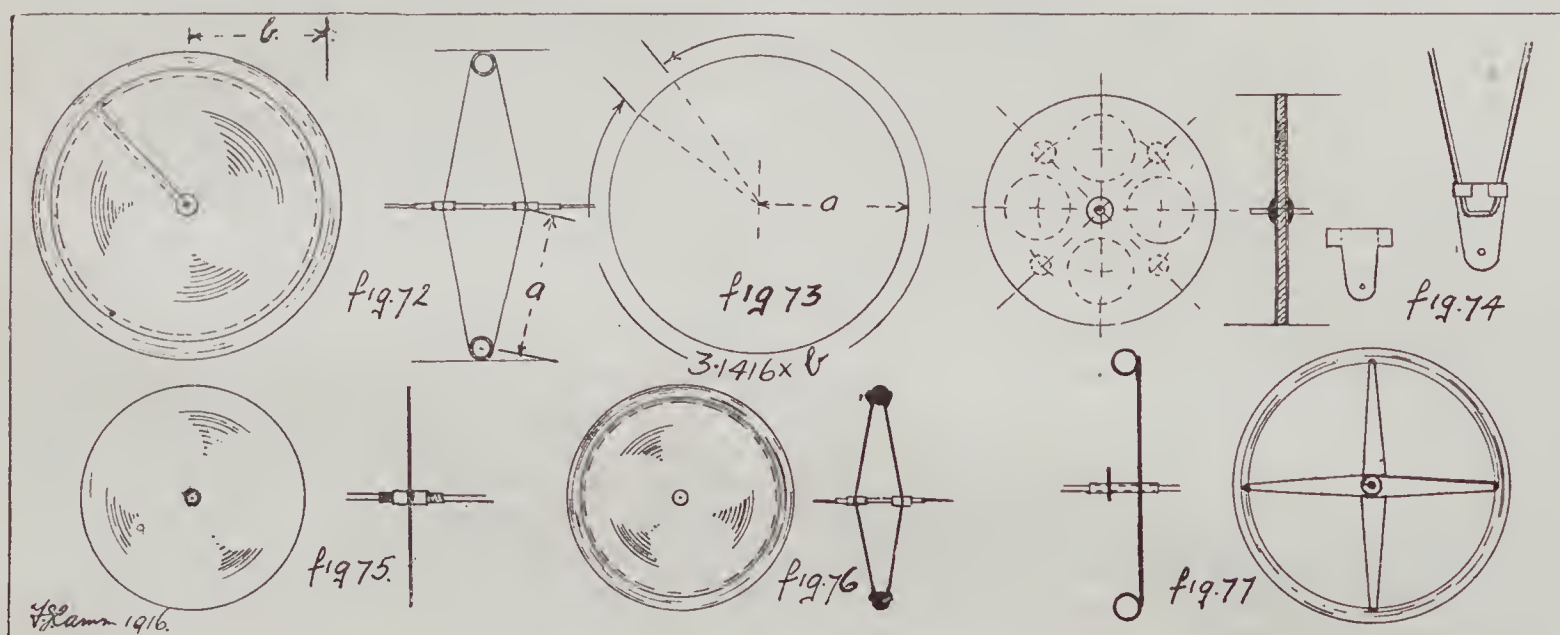
By F. J. CAMM

SOME recent correspondence has suggested that I should go more fully into the construction of wheels than I hitherto intended. Accordingly some illustrations are given of a few simple types of wheels. Of course, where a lathe is obtainable the construction of wheels is reduced to a simple matter indeed, for, by turning a pair of dies (or, more correctly, press tools), it is possible to press blanks of metal to a much neater shape than is obtainable by other methods. Withal, the one pair of dies will turn out thousands of blanks of exactly similar shape, whereas by other methods each wheel requires careful shaping and pairing.

However, where only one pair is required of a given diameter, it would scarcely pay to go to the trouble of turning a special pair of dies. The disc wheel drawn in Fig. 72 is constructed from either sheet tin or copper and a brass curtain ring. These latter are obtainable in various diameters, from two inches upwards, and are quite light. The discs for the sides are cut to the radius a (Fig. 73), and round the periphery of each the circumference of the wheel, of radius b , is measured off. Connecting up the two points thus located to the origin or centre of the circle, the sector of metal that will require to be cut away is determined. An eighth of an inch should be allowed, to form the seam. By

of wheels so built is quite surprising. The cross-section of the sheet from which they are cut is decided by the weight of the model for which they are intended. For models of from four to eight ounces in weight $\frac{1}{8}$ of an inch three-ply will be quite suitable. Lightening holes are cut or drilled in them as shown, and this should be done *before* the outside is cut. It will be found convenient, from the point of view of exactitude to clamp both pieces together, drilling and cutting two wheels in the one operation. A piece of brass tube forms the boss, and this is secured by two cupped washers which are soldered to it, one on each side of the wheel. A piece of silk should be glued over each side to increase the strength and lessen head resistance. A suitable chassis attachment is also shown in this figure. The wire chassis members are soldered to a thin plate of the shape shown, a hole in the plate engaging with the axle.

Another exceedingly light (and weak) wheel suitable for record-breaking models is that shown in Fig. 75. A disc of celluloid is cut (this can be truly executed by a washer cutter secured in an ordinary band brace), and the boss locked through the centre; this is effected by threading the tube constituting the hub and tapping the collars, screwing both these home tightly, without cutting through the material.



bringing the two edges together the blank assumes the shape of a cone. The seam should be neatly soldered; the edges could, of course, be butted, and solder "run" down the joint to close it, and perhaps this latter method will be found the neatest. Now carefully place the disc upon the brass ring, locating it quite centrally, so that the finished wheel will run concentric, and scribe its position upon the brass. With a hot iron solder should be "run" round until it flows evenly through the space between the disc and the ring. Before the second disc can be similarly fixed, the boss or hub must be made, as this is inserted to form a distance piece to keep the sides from crushing in (see Fig. 73). A suitable length of brass tube is cut, and the inside collars (of the same material), which must telescope over them, soldered into place. Passing this bush through the disc already fitted, and pushing the disengaged end of it through the second disc, this latter can be located and sweated on. Two collars pass over the bush ends, are tapped home over the jaws of a vice, so that the discs are gripped between the inside and outside collars, and soldered. A coat of transparent varnish should be given to obviate rust. A pair of such wheels of 4-in. diameter should weigh about three and a half ounces. The difficult part in their construction is to fix the position of the disc in relation to the ring to secure concentricity.

Fig. 74 shows a wheel cut from three-ply. The strength

If a lathe is available, it will be possible to undertake the construction of the wheel sketched in the following figure. A pair of dies (negative and positive) are turned so that when a blank of metal is inserted between them, and pressure applied, the metal bedding home in the recesses of the die assumes the shape shown in the front (or rear) elevation of Fig. 76. The boss could be turned also, turning the outer and middle portions down to leave two collars. The two blanks are secured together by the outside collars which are soldered to the boss. Suitable rubber tyres are sprung over the periphery and cemented in with seccotine.

Another simple form of wheel is shown in Fig. 77. Here, again, curtain rings are requisitioned; two strips of tin are affixed at right angles to one another one on each side of the wheel. A plain piece of tube only is necessary here to form the boss; it is soldered to the transverse strips.

(To be continued)

REPLIES TO CORRESPONDENTS

- L. C. (Clapton)—(1) The dimensions given in your sketch are correct for a model weighing from 5 to 6 ounces. As you do not state the weight of the machine, it is only possible to hazard a few suggestions. (2) Use carved propellers for greater efficiency, although quite satisfactory results can be obtained from bentwoods. (3) If the pitch of the propellers is equal to twice the

diameter then seven strands of $\frac{1}{4}$ in. strip will be found sufficient. (4) Let the cross section of the mainspar be $\frac{3}{8}$ by $\frac{1}{16}$ in. if a solid one is used, or $\frac{1}{2}$ by $\frac{3}{8}$ in. if a hollow one. The latter would obviously be the better to use.

C. W. F. G. (Scarborough)—Glad to know the information given was satisfactory. The rear spar of the "Mann" is, we believe, 7 ins., not 17.

A. E. S. (Streatham Common)—Reply has been sent.

STATEMENTS IN PARLIAMENT

HOUSE OF COMMONS

February 21. *Insurance Against Aircraft*—Mr. Pretzman (Chelmsford), replying to an inquiry by Mr. Thomas (Derby, Lab.), said that when the Government insurance scheme against aircraft was introduced in July full notice was given that no compensation could thereafter be paid in respect of property that was not insured under the scheme, and it would be impossible to depart from that principle without endangering the whole scheme. Special facilities for insuring small property were given by the Post Office scheme, which was introduced in November. The rate is 6d. for an insurance for £25.

The Anti-Aircraft Corps—Dr. Macnamara (Camberwell, N., L.), replying to Mr. Joynson-Hicks (Brentford, U.), said the members of the Anti-Aircraft Corps would, generally, continue to serve under the War Office under the same conditions as to pay and discipline as at present. He made one exception to that general statement; it was that men of military age engaged at present only half-time would be given an opportunity of attesting for service otherwise with the armed forces of the Crown.

Air Policy—Captain Bennett-Goldney (Canterbury, U.) complained of the misleading statements which had been made by Ministers in the past as to our preparedness for dealing with aerial raids. In the daylight raid on the previous day (February 20) the enemy aircraft as on previous occasions left our shores unscathed. Regarding the daylight raid on Dover on January 23, the Under-Secretary for War had by answer in the House—partly based on a memorandum received from the Admiralty—given an impression which was far from being in agreement with the facts. The machines were not ready and the officers were not present. Were the machines armed, and if so how was it that in the scramble at least one airman had to go up with only a Winchester rifle and some five rounds of ammunition? The ascent was made after the enemy aeroplane was out of sight. What happened was a battle between one of our aeroplanes and one of our seaplanes, each of which mistook the other for the enemy. Having witnessed the fray, our anti-aircraft gunners turned their fire on both, and in the vain attempt to bring them down managed to damage the tower of Walmer Church and injure some of the men in barracks. He asked whether after 18 months of war we had a sufficient number of fully-trained air pilots and air gunners to man the machines which the Munitions Department had now provided. He wished to know whether our teaching school had fully trained pilots to take up young gunners for instruction, and whether there was a sufficient supply of aeroplanes for the purpose. Were there properly equipped repairing sheds and were there healthy quarters for the men? He believed there were none of these things. The Government had said that they were preparing suitable landing places in the neighbourhood of London, but were there any night landing places being made ready on the East Coast and in Kent, elsewhere than in the London district? Only yesterday when walking near some open ground which had been chosen as a landing place in a certain part of Kent he found that the land had only recently been ploughed up. Then could the Government tell the House how it was that our anti-aircraft guns at Dover only fired percussion shells recently, shells whose efficiency depended on direct hits? If our airmen could receive earlier news of the approach of the enemy they would be in a better position to meet him. Flying was only possible on certain days, and he thought there should be air patrols on the other side of the Channel on suitable flying days. If we had also such patrolling on our own coast there would be proper warning, and then London and the Midlands might consider that the heroism of our airmen would protect them against Zeppelins and other aircraft.

February 22. *Zeppelin Raids and German Investments*—Mr. Newdigate (Tamworth, U.) inquired whether compensation to sufferers by Zeppelin raids could be given out of German investments in this country.

Mr. Asquith (Prime Minister): As arrangements have been made for special insurance against air raids I do not think that the question calls for further consideration at present.

The Dover Air Raid—Mr. Tennant said he would reply, first, to the Dover case, with regard to which a startling and dramatic statement had been made yesterday (February 21) by the hon. member for Canterbury, for it was desirable that rumour of that kind should receive as early a contradiction as possible. He could not give a detailed account of what actually occurred. On the date in question, when two hostile aeroplanes came to Dover, the Admiralty were in charge of the defence. Aeroplanes were provided by the War Office; it was not their primary duty to provide them, and were ready to attack hostile aeroplanes at that time. The hon. member for Canterbury had said that the mess to which the officers had gone for luncheon was two miles away; it was only 200 yards. He had said also that the pilot went up armed only with a rifle or revolver. (An hon. member: "A

Winchester rifle.") What really happened was that the pilot went up in an aeroplane which belonged to a squadron in process of formation and not yet armed, but as it was a very fast machine the commanding officer allowed him to go up. He was not sure whether there was a rifle or was not a rifle in it, but he believed there was. These statements were merely to show how far from the true facts the statement of the hon. member for Canterbury was. The point was that the Admiralty were in charge at the time.

Mr. W. Rutherford (Liverpool, West Derby, U.): Oh, yes, it was the other fellow.

Mr. Tennant said that to represent that things were in a muddled state was not only contrary to the facts, but calculated to spread despondency.

February 23. *The Air Raids*—Mr. Balfour, in reply to Sir J. Lonsdale (Armagh, Mid, U.), said that in the attacks on Lowestoft and Walmer on Sunday (February 20) the enemy seaplanes approached at a very great height, and were not observed either by look-outs or patrols until they dived just before their bombs were dropped. In each case, naval fighting aeroplanes and seaplanes from the nearest naval air stations proceeded immediately in chase, but were unable to sight or get into touch with the enemy machines.

Mr. Tennant, replying to a question by Sir J. Lonsdale as to whether any military aeroplanes were sent up against the German seaplanes which threw bombs at Walmer and Lowestoft on Sunday, the 20th inst.; and at what time the authorities received warning of the enemy's approach; and at what time the defending aeroplanes went up, stated that no military aeroplanes were sent up against the German seaplanes which dropped bombs over Lowestoft. As regard Walmer, the nearest station received information at 11.35 a.m., and the first aeroplane ascended at 11.45 a.m. In answer to Mr. Fell (Great Yarmouth, U.), he said the orders, formerly announced, that all Zeppelins were to be fired at if and when they offered a target still held good. Ball cartridge was available for the purpose in the hands of the troops.

Mr. Fell said he had the most explicit information that not only had they no orders to fire, but that there were actual orders not to fire at the Zeppelins, however close they might be.

Mr. Tennant: I wish the hon. gentleman had been so good as to give me the source of his information.

February 24. *Manufacture of Anti-aircraft Guns*—Answering Sir A. Markham (Notts, Mansfield, U.), Colonel Lee (Hants, Fareham, U.) said that under instructions issued on February 10 the manufacture of certain anti-aircraft guns for home defence was given priority over that of certain classes of field guns, of which the existing and prospective deliveries were so large that it was possible to adopt the above course.

Sir A. Markham: Then are we to understand that we have so many field guns that these field guns were not necessary for the forces at the front?

Colonel Lee said he did not say so. There was no intention of taking any action detrimental to the interests of our forces in the field.

Sir A. Markham asked the Prime Minister whether, seeing that he took the ordering of ordnance and the design of guns out of the control of Lord Kitchener last autumn and placed the same in the hands of the Minister of Munitions, he would say whether he authorised Lord Kitchener to state that the construction of anti-aircraft guns for home defence has now priority over other ordnance; and, if so, what were the reasons which led the Government to take this step to the detriment of the men fighting in the field?

Mr. Asquith: The accelerated manufacture of anti-aircraft guns will not be to the detriment of the supply of the forces in the field. The priority given to the production of such guns, which was the result of a decision of the War Committee, will only affect certain classes of lighter ordnance with which the Army is already well supplied. Lord Kitchener made his view clear by a statement in another part of his speech, that "the people of this country do not desire to give too great importance to these attacks or allow them to affect our military operations."

Sir A. Markham: Is the right hon. gentleman aware that the Under-Secretary for the Munitions Department stated that anti-aircraft guns have been given precedence over the manufacture of field guns, and is he aware that many field guns have been very badly worn?

Lord Derby and the Air Service—Mr. Asquith, replying to a question put by Sir J. Bethell (Essex, Romford, L.), said: I am glad to be able to announce that Lord Derby has accepted the Chairmanship of the Joint Military and Naval Committee appointed to supervise the air service, and with his accustomed public spirit my noble friend has volunteered to act without any remuneration. (Hear, hear.)

HOUSE OF LORDS

February 22. *Zinc for Zeppelin Gas*—Lord Devonport stated he had ascertained that since the beginning of the year there had gone direct from Rotterdam to Belgium 20,000 tons of zinc ore. The one was sent to Liège, where there was one of the biggest spelter producing companies on the Continent. This, of course, was under German control, and, therefore, the zinc ore which we allowed to go into Rotterdam went openly to a place where it was converted into spelter and circulated all over Germany. The quality, too, was the very one which Germany required in the

preparation of hydrogen gas. The Government must overcome the difficulty in preventing this ore going to Rotterdam to enable German Zeppelins to pay their too frequent visits here.

MUNITIONS DEPARTMENT AND AEROPLANES—In a written reply to Mr. Pratt, circulated with the Parliamentary papers on February 25, Colonel Lee says the Ministry of Munitions has no responsibility for the production of aeroplanes or aeroplane engines, nor for the provision of motor vehicles for the purposes of war.

AIRCRAFT IN ACTION

OFFICIAL INFORMATION

ENGLAND

February 21—Twenty-six Aeroplanes Attack Don—An attack on the depots at Don was carried out by 26 aeroplanes yesterday (February 20). Extensive damage is believed to have been done to the stores and railway. All machines returned safely.

(Don is an important junction, east of La Bassée, on the road to Lille.)

February 21—Enemy Attack on Towns—Enemy's aircraft has during the last few nights made several night attacks on the various towns in our area with no military result. A few civilians were, however, killed. (See German Official)

February 21—The Seaplane Raid—War Office announcement: "Air Raid. Correction. Later information obtained states that the casualties at Walmer were over-estimated, the total being one lad of 16 or 17 killed, and another of the same age injured. About 20 shop fronts in the town were blown in. (See German Official)

February 22—Aviator's Wonderful Pluck—One of our aeroplanes was struck by an anti-aircraft shell. The pilot's leg was practically severed. He managed, however, to land his machine safely in an aerodrome and without injury to his observer.

February 25—January Air Raid—War Office announcement: "The following are the final figures of casualties from the air raid of January 31:

	Men	Women	Children	Total
Killed	27	25	15	67
Injured	45	53	19	117
	72	78	34	184

"These figures are greater than those previously given (59 killed, 101 injured), because several persons reported as injured have died of their wounds, and because the police have found on further inquiry that some children under sixteen had been returned as adults and that several cases of slight injury had been treated at hospitals and sent home without any record being kept. The number of bombs now known to have been dropped is 393."

February 25—Raid on Lille Aerodrome—Yesterday (February 24) our aeroplanes carried out a successful bombing raid against an enemy aerodrome near Lille. All our machines returned safely.

FRANCE

February 21—Munition Depots Bombarded—A squadron of five French aeroplanes bombarded the enemy's munition depots at the Château Martincourt and Azoudange, south-west and south-east of Dieuze (Lorraine).

Some German aeroplanes dropped bombs last night (February 20), on Lunéville, Dombasle (south-east of Nancy) and Nancy. Only slight damage was done.

February 21—Zeppelin Shot Down—Great Aerial Activity—The day was marked by numerous fights in the air. Over Talsdorf, east of Altkirch, one of our aeroplanes attacked at very close quarters a Fokker, firing 15 shots at it. The enemy machine side-slipped on its right wing and then fell. In the region of Epinal an Albatros was brought down by our artillery fire. In the region of Bures, north of the Forest of Parroy, a German machine was attacked by two of our aeroplanes and fell within our lines. The pilot and the passenger were killed. A squadron of seven French machines fought four enemy aeroplanes in the region of Vigneulles les Hattonchâtel. Two of the latter were forced to land. The two others fled. Enemy machines bombarded Fismes, Bar-le-Duc, and Révigny. Near this last point a German air squadron of 15 machines was attacked by one of our chaser squadrons and was forced to fight. One German machine was brought down near Givry-en-Argonne. The two aviators were made prisoners. A second enemy machine, which was pursued, dived suddenly into its own lines. One of our bombarding groups, composed of 17 aeroplanes, dropped 70 bombs of heavy calibre on the aerodrome of Habsheim and on the goods station of Mulhouse. Another group of 28 machines dropped numerous bombs on the enemy's munitions factory of Pagny-sur-Moselle. At the conclusion of these several operations, all our machines returned to their landing grounds.

A Zeppelin, flying south from St. Menes, was brought down by the motor-gun section of Révigny. The Zeppelin was shot through with an incendiary shell, and fell in flames in the neighbourhood of Brabant-le-Roi. (See German Official)

February 22—The Loss of LZ77—The Zeppelin brought down at Brabant-le-Roi is the LZ77, of very recent construction. It was set fire to by an incendiary shell, and, on coming to earth, was further destroyed by the explosion of the bombs on board. The naked bodies of the officers and men forming the crew of the Zeppelin have been

found in the cabin-boat. A Zeppelin flew over Lunéville yesterday evening (February 21) and dropped some bombs, which, however, only caused very insignificant material damage. Being closely pursued by our patrolling machines, the airship disappeared in the direction of Metz.

February 24—Raid on Metz—In the course of the night one of our bombarding air squadrons dropped 45 bombs, several of them of large size, on the railway station of Metz-Sablon, and on the gasworks. A large outbreak of fire was observed immediately afterwards.

February 26—144 Bombs on Metz Station—To-day (February 26) in the region of Verdun, Adjudant Navarre, on a monoplane, brought down with machine-gun fire two German aeroplanes. This makes five enemy aeroplanes brought down by this pilot. The enemy machines fell in our lines. Two of the airmen who manned them were killed. The two others were taken prisoners. During the day also, one of our air squadrons, consisting of nine bombarding aeroplanes, dropped 144 bombs on the station of Metz-Sablon. Another of our squadrons bombarded the enemy establishments of Chambley, north-west of Pont-à-Mousson. (See German Official)

RUSSIA

February 21—Successful Airship Raid—On Saturday (February 19) at about 11 o'clock at night, our aeroplanes dropped several dozens of bombs on the station and town of Buczacz (in Galicia). As the result of the dropping of one bomb, weighing 36 lb., huge reddish flames and thick smoke were seen.

Our airship the Vtoroi dropped on the station of Monasterjisko 10 bombs of 72 lb. each, five of 180 lb. each, and a box of steel arrows.

February 22—Enemy Aeroplanes Active—In the Riga and Dvina sectors between the Oger and Probstinschoe numerous enemy aeroplanes dropped bombs. At the village of Khmelieka, in the Buczacz region, the enemy dropped incendiary rags from an aeroplane.

February 23—Two Zeppelins over Dvinsk—Several German aeroplanes dropped bombs on the districts of Riga, Friedrichstadt, and Jacobstadt. Two Zeppelins flew over Dvinsk.

February 24—Enemy Aeroplanes Active—Above the Riga region and in the Dvina-Ogger-Probstinschof sector German aeroplanes appeared and threw bombs. In the Black Sea, near the Bosphorus, one of our submarines was twice attacked without result by two enemy aeroplanes.

DARDANELLES

February 25—Turkish Aerial Activity—Turkish Official: "Enemy aeroplanes recently flew over the Dardanelles, but were driven off and pursued by our battle aeroplanes. On February 20 an enemy cruiser which was under the protection of mine-sweepers penetrated the Gulf of Saros (north of Gallipoli Peninsula) supported by three enemy observation air machines, and unsuccessfully bombarded the coast near Galata and Gallipoli. One of our battle aeroplanes attacked the enemy aeroplanes and drove them off, whereupon the cruiser ceased fire and departed with the mine-sweepers."

MESOPOTAMIA

February 21—Bombs on Kut—War Office announcement: "Information has been received from the General Officer Commanding the troops in Mesopotamia that on February 17 and 19 bombs were dropped by hostile aeroplanes on our camp at Kut, but that no damage was done."

EGYPT

February 21—Enemy Power Station Destroyed—War Office announcement: "A telegram received from the General Officer Commanding-in-Chief in the Mediterranean states that in the course of an aeroplane reconnaissance of the enemy's advanced posts east of the Suez Canal on February 20, one of our aviators, descending to 600 ft., destroyed the enemy's power station at El Hassana with a 100 lb. bomb."

(El Hassana is nearly 50 miles east of the southern end of the Canal.)
February 27—Aerial Reconnaissance—War Office statement: "By 3.30 p.m. the enemy had been completely routed and was fleeing in scattered parties, pursued by our cavalry. At 4 p.m. aeroplanes reported them to be eight miles south-west of Agagia, still being pursued."

JAPAN

February 22—Aircraft Accompany Japanese Warships—A Copenhagen message, which may be taken as authoritative, states that: "The German newspapers quote the Italian journals for the statement that the Japanese Fleet 'safely arrived in the Mediterranean, having with them a great number of aircraft.'"

AUSTRIA

February 22—Air Raids over Lombardy—One of our air squadrons attacked some factories in Lombardy. Two aeroplanes reconnoitred over Milan, and another squadron attacked an Italian aeroplane station and the harbour of Desenzano, on the Lake of Garda. In both cases much damage was observed. In spite of violent hostile artillery fire all the aeroplanes returned safely.

February 23—Austrian Attack on Durazzo—An Austro-Hungarian aviator bombarded the Italian ships in the harbour of Durazzo. A transport steamer took fire and sank.

GERMANY

February 21—Enemy Positions Successfully Attacked—Our aeroplane squadron attacked several enemy positions situated behind the enemy's lines—such as Furnes, Poperinghe, Amiens, and Lunéville. Many successful results were observed.

Our naval aeroplanes freely dropped bombs on the flying ground and troop encampments at Furnes, south-east of La Panne. The machines returned undamaged. (See English and French Official)

February 21—Naval Air Attack on English Coast—On February 20, at noon, naval air machines attacked the English coast. Factories at Deal, railway and harbour works, and a gasometer at Lowestoft were liberally bombarded with good results. The main station and the harbour works at Lowestoft were hit several times. The gasometer collapsed from the effects of the bombs. In the Downs two tank steamers were pelted.

Despite bombardment and pursuit by enemy aviators, our air machines all returned safe. (See English Official)

February 22—Aerial Encounters Behind British Lines—Numerous aerial encounters took place, especially behind the British front.

February 22—German Airship Lost—A German airship last night (February 21) fell a victim to the enemy's fire near Révigny.

February 23—Aerial Advantage Behind Enemy's Lines—In numerous aerial flights behind the enemy lines our aviators had the advantage.

February 27—The Air Raid on Metz—In Flanders our air squadrons renewed their attacks on enemy military camps. In Metz eight civilians and seven soldiers were wounded or killed by bombs dropped by an enemy aviator. Some houses were also damaged. As the result of an air battle, in which our anti-aircraft guns rendered aid, a French aeroplane which had got within reach of the fortress was shot down, and its occupants, including two captains, were captured.

(See French Official)

FROM OTHER SOURCES

ENGLAND

February 20—Seaplane Picked up in the North Sea—Captain Blain, of the steamship *Frainfield*, from Methil to Rouen, reports that on Wednesday (February 9) he picked up a seaplane, which was floating bottom upwards in the North Sea, and delivered it to the military officer at Rouen.

February 20—Fatal Zeppelin Souvenir—A young Lincolnshire farmer was blown to pieces on Friday night (February 18) by the detonator of a Zeppelin bomb. His sister on Sunday found the article, which she thought was a radiator fan from a motor car. Her brother, turning round the propeller, ignited the charge. The woman was injured in the leg, but a youth who was in the same room escaped injury.

February 20—Locating a Battery—From a correspondent at General Headquarters in France: "The difficulty of silencing a well-placed battery is incredible. Quite recently German aviators succeeded in locating the whereabouts of a concealed battery of field artillery which had done much execution. Their own gunners got on to the spot and poured in a little avalanche of shells. The German observation officers were, apparently, quite satisfied that they had done the business of the troublesome battery by the time the 'cease fire' was ordered. Actually they had done no damage worth mentioning.

February 21—The Walmer Visit—It is now quite obvious that some of the official statements issued by the War Office with regard to the air raid at Walmer on February 20 were inaccurate. The official report stated that as a result of the raid three persons were killed and one wounded, but it has now been definitely established that only one person was killed, a youth of 16, and another youth, aged 17, was seriously wounded. Both these casualties occurred at the same spot, and were the result of the bursting of the first bomb which fell on the land. With the exception of a marine, who at the time was outside the barracks and had his leg slightly cut by splinters of glass, these were the only two casualties. The time stipulated as that at which the raid was carried out is also wrong, for the opinion of eye-witnesses is that when the raiders got within striking distance of Walmer it was barely 11.15 a.m., and the statement that our own aviators were on the spot before the enemy arrived is also questioned. What really happened was that the raider made his appearance quite suddenly and unexpectedly, and barely five minutes elapsed between the dropping of the bombs in the sea and on the land.

February 21—Lowestoft Protest—As a result of what happened on the occasion of the raid by German seaplanes on Sunday, Lowestoft Town Council met on February 21 and passed the following resolution: "That in view of the fact that about 11 o'clock in the forenoon of yesterday German aircraft were able to visit this town and to drop at least 17 bombs, which exploded in various parts of the town, and that they succeeded in leaving without injury, this Council protests against the defenceless state in which the persons and property of the inhabi-

tants were found to be; that a full and impartial investigation is called for into the circumstances under which any attempt at resistance proved to be so completely futile; and the Council calls upon the Government to take immediate measures for providing adequate and effective defences, and that such defences shall be in instant readiness both day and night to repel hostile attacks either by air or by sea." Copies of the resolution were ordered to be forwarded to the Prime Minister, the First Lord of the Admiralty, and the Secretary of State for War.

February 22—German Aviators on British Front—Since the occupation of an unimportant advanced post near Boesinghe enemy activity in the British area has been almost entirely confined to artillery attacks and the bomb-dropping exploits of aviators, whose industry is only equalled by their inaccuracy. Repeated raids over inhabited towns have not yielded the slightest military success. For a week German aviators have been visiting us in the dark; they have killed a few civilians and two horses. Some of these attacks were retaliatory—inspired by successful British raids on the aerodrome at Cambrai and the railway junction at Don—but, aside from such "reprisals," the feverish energy of enemy aviators is undoubtedly due to a new policy of "frightfulness." One obvious result has been the increase in aeroplane combats. The raiders have not always escaped into their own lines; three enemy machines were brought down on Saturday (February 19), and others failed to reach the object of their attack. Coupled with the aerial attacks have been specific bombardments of towns behind the British front—some of them being treated to a combination of heavy howitzer and aeroplane explosives on the same day.

February 25—German Railway Bombed—The *Echo Belge* learns from Maastricht that Allied airmen dropped bombs between Gemmenich and Bleyberg on the Aix-la-Chapelle-Visé railway line which is now under construction. The rails were destroyed at several points. Anti-aircraft guns at Gemmenich fired at the raiders.

FRANCE

February 14—Attempted Zeppelin Raid on Rouen—A Zeppelin was signalled on Saturday night (February 13) near Rouen. It was just turned nine o'clock when the lights of the town were suddenly extinguished. At first it was thought that experiments were being made in view of a possible raid, and in some places of amusement, which were plunged into total darkness, the public took the incident in good part. In Rouen theatre candles were lit and the orchestra struck up familiar tunes, the choruses of which were heartily sung by the audience. At ten o'clock, however, the noise of cannon could be heard coming from the direction of Montgargan and Montriboudet, and immediately afterwards the inhabitants were warned in the usual way of the approach of enemy aircraft. Half-an-hour later the safety signal was given, the Zeppelin having turned tail.

(A notice of this attempted raid appeared in our issue of February 16.)

February 17—More Powerful Searchlights for Paris—It is announced by the *Journal* that the French Government has decided to use Dussaud's invention for so-called "cold light" in order to increase the power of the anti-Zeppelin searchlights. The invention, which is four years old, results in almost the entire current being used as light instead of losing 80 or 90 per cent. in heat as is the case at present. By this method, which it is believed is used in the searchlights mounted on Zeppelins, a Zeppelin can be detected even in fog.

The Aviation Committee of the Senate having examined the report of the delegations which visited the aircraft factories in Paris and the suburbs has come to the conclusion that French military aviation has made undoubted progress, and that it is now worthy of inspiring the confidence of the nation.

(No comment made)

February 17—Chateau Destroyed in Upper Alsace—During last week the castle of Baron Reinach, at Hirzbach, south of Altkirk, was destroyed by French aviators, where the Germans had established their local headquarters. The art treasures contained therein, which had not been removed, were destroyed at the same time as the castle.

February 21—Bombs on Amiens—During the night of Sunday-Monday, between ten and eleven, two enemy aeroplanes flew over Amiens. They dropped six bombs—one killing a widow and two children. The other bombs did very little damage, mostly falling on waste land.

February 23—Enemy Aeroplane descends near Epinal—German aeroplanes flew over the town; one, an Albatros, was forced to descend immediately by our gunners. The two passengers were killed. The machine fell to the earth in flames, the bombs exploding, causing some casualties in the curious crowd.

February 23—Four Bombs on Nancy—A squadron of six machines, coming from the north, was approaching Nancy, and was forced to turn back by our machines and our fire. Some hours later one solitary machine appeared over the town and dropped four bombs, killing a man of forty-eight. The three other bombs, two of which were incendiary, caused no material damage, though they killed one aged civilian.

Two Victims at Bar-le-Duc—Five enemy aeroplanes flew over the town, dropping eleven bombs and killing two people. One fire was caused.

February 20—Three Aviatiks over Châlons—Sunday morning (February 20) about eleven o'clock, two Aviatiks flew over Châlons. They were met by a violent fire from our anti-aircraft guns and were obliged to give up their plan. A third Aviatik during the afternoon met with no better success. It disappeared after dropping some bombs on Lépine, which did no damage.

DARDANELLES

February 17—Transport Bombarded—On February 17, according to the latest Constantinople communiqué, a Turkish aviator bombarded a transport anchored near Mudros. The forepart of the vessel was set on fire.

MESOPOTAMIA

February 21—Supplies by Aeroplane—Cheery messages come through from General Townshend. He is sowing vegetable seeds and has asked for gramophone needles. These and other light requisites are dropped in his camp by aeroplane. He reports sufficient supplies for a long period to come.

RUSSIA

February 21—Aeroplanes Drop Leaflets over German Lines—The correspondent of the *Morning Post* states: "Among the prisoners captured many had on them leaflets relating to the story of the fall of Erzerum and its meaning. It was thus discovered that the Russian authorities had taken early steps to dishearten the enemy. An enormous number of these leaflets were thoroughly distributed over the German lines by Russian aeroplanes. Hence the rage of the Germans when the Russian soldiers in the trenches began to rub in their good news."

ITALY

February 14—Air Raid in North Italy—Two Aviatiks appeared over Milan at nine o'clock this morning (February 14), and continued to drop bombs for half an hour. They caused very little damage to property, eight deaths and some seventy persons injured being so far reported. No building used for military purposes was touched, nor is there any soldier in the list of victims. Fortunately, no monument or important edifice suffered damage. The enemy aeroplanes, which were bombarded by the anti-aircraft guns, were attacked by Italian aviators, but they succeeded in making their escape to the frontier. A third enemy aeroplane made a simultaneous appearance over Monza, about fifteen miles north of Milan, and dropped bombs. One man was killed and several persons were injured.

One of the bombs dropped at Monza fell in the enclosure of the King Humbert Memorial Chapel.

Towards 9.30 this morning (February 14) enemy aeroplanes dropped two incendiary bombs in the neighbourhood of Treviglio and three on Bergamo, without causing any damage.

This morning (February 14) about a quarter to ten, six enemy aeroplanes appeared over the suburbs of Brescia, but, owing to the heavy fire of anti-aircraft artillery, they were unable to approach the town, and flew away.

(See Austrian Report)

February 15—The Air Defence of Milan—The military authorities are well satisfied with the efficient work of the anti-aircraft batteries, which are manned entirely by citizen volunteers. During yesterday's (February 14) air raid these batteries co-operated most effectively with the numerous aviators who had risen to pursue the raiders, and they prevented the Austrians from reaching the centre of the town or damaging the railway stations. It was only in the outskirts of the city that they succeeded in coming low enough to drop their bombs with any degree of accuracy.

Further particulars from Ravenna concerning the raid (February 12) there show that the enemy aviators deliberately aimed at the art monuments, which are of incalculable value. The wonderful mosaics of the Basilica of Sant' Apollinare are safe, and the raiders only succeeded in destroying the ceiling and the cinquecento porch.

February 15—Attack on Schio—Hostile aeroplanes appeared yesterday (February 14) over Schio and dropped bombs, killing six persons and wounding some others.

February 15—Air Raids on Italy—The total number of victims in connection with the enemy aeroplane raids on Milan, Monza, Bergamo, and Treviglio, is thirteen killed and about forty more or less severely injured.

February 15—Attack on Rimini—This morning (February 15) at about four o'clock, enemy aeroplanes flew over Rimini and dropped bombs. They were effectively met by our anti-aircraft guns and made off in a north-easterly direction. Very slight damage was done. Two civilians were wounded.

February 19—Austrian Raider Brought Down—The Udine correspondent of the *Corriere della Sera* telegraphs that observers in the Chiese valley saw one of the Austrian aeroplanes on its return from Milan come down precipitately in the valley of the Boeche di Cadria, having been hit by an anti-aircraft battery. It fell in a deserted spot, where it remained for two days abandoned. Later a small number of Austrians were seen carrying debris of the aeroplane, but it could not be discovered if there were any human bodies.

February 21—Austrian Raiders Foiled—Alarm signals fired at ten o'clock this morning (February 21) warned the inhabitants of Milan of a possible repetition of last Monday's air raid. At the same time the sky was alive with Italian aeroplanes which had risen some time before. They circled over the town, then rose rapidly, about 20 machines being visible at one time, and finally went off in a north-easterly direction. The news had been received that enemy aeroplanes had been sighted at Brescia. Nearly an hour passed and nothing happened, when finally, in the distance, over the direction of Monza, a number of shells exploded. Many seemed to be fired from the

Italian aeroplanes in active pursuit, and an aerial battle appeared in progress.

Rome: Enemy aviators this morning (February 21) flew over various places in the provinces of Brescia and Milan. Only insignificant material damage was done, but at Desenzano two persons were killed and some others wounded, at Salo one person was wounded, and at Trezzo, on the Adda, two persons were killed and four wounded. All the victims were civilians. Bombs were also dropped on Gargnano, and one fell on the hospital of Feltvenelli though the Red Cross flag was flying. No damage was done.

February 26—D'Annunzio Wounded—It is feared that Signor Gabriele d'Annunzio, who is now in hospital at Venice, will lose the sight of one eye as the result of wounds received while serving as an observer in an aeroplane.

BALKANS

February 11—German Seaplanes at Varna—Since the last bombardment the fortifications of Varna have been considerably strengthened. There are now German submarines and two seaplanes in the port, and heavy German guns are mounted in the forts.

February 15—Damages in Salonika Air Raid—It is reported that an agreement has been reached between the Government and the British and French Ministers as regards the losses sustained by merchants at Salonika and others, owing to the recent bombardment by a Zeppelin. A complete list of the damage done has been drawn up by the Prefect of Salonika, and, it is expected, will be submitted to the British and French Ministers. No indemnities will be paid before the end of the operations in Macedonia.

February 16—French Air Raid on Strumnitza—Yesterday afternoon (February 15) thirteen French aeroplanes raided the encampments in the Bulgarian town of Strumnitza. About 150 bombs were thrown, and several fires were caused.

According to a Reuter telegram from Salonika, the machines, although heavily bombarded, returned untouched.

February 16—German Aviators in Bulgarian Thrace—Of Turkish troops in Bulgarian Thrace there are none. As to German troops, they consist of fifty infantrymen quartered at Xanthi, four aeroplanes and an aerodrome (on an empty site before the building of the Ottoman Tobacco Régie) and officer aviators.

February 17—Rumanian Air Scouting—A telegram from Bucharest states that, being very anxious regarding the movements of Germano-Bulgarian troops on their frontier, the Rumanian Government sent three squadrons of aeroplanes over Bulgaria. The aviators reported that they had seen troops estimated to number 50,000 and a few new trenches, but no heavy artillery. During the raid the Rumanian aeroplanes evaded a very heavy infantry and artillery fire.

February 17—German Machine Brought Down—A French aeroplane this morning (February 17) intercepted a German Aviatik of the latest pattern engaged in photographing the French lines at Kara Suli, north of Salonika. A fight ensued at an altitude of over 2,000 metres, resulting in the German machine, which was mounted by an officer and a pilot, both Prussians, being compelled to descend. The officer was badly wounded with five mitrailleuse bullets in his thigh, while the pilot, who, it is believed, was also hit, managed to escape. A number of mounted men were sent in pursuit of the aviator, who, in order to better his escape, discarded his boots. He also lost his cap in his flight. The French aviators and aeroplane were not touched. The German machine, which will be on view to the public in Salonika to-morrow, was also practically intact, including the photographic apparatus and plates, which are at present being developed by the French. General Sarraill decorated the French aviators—one with the Legion of Honour and the other with the Military Medal.

February 17—Enemy Aerial Bombardment Probable—There are serious reasons for thinking that the enemy meditates a fresh aerial bombardment of great proportions upon Salonika.

February 17—Air Raid on Strumnitza—The German aeroplanes are recommencing their incursions. Yesterday (February 16) an aeroplane tried to reach Zeiterliek, but in less than a minute it was the target of fifty-three shells. The aeroplane dropped a bomb, which fell into the mud and failed to explode. At Topom and Djuma two other aeroplanes attempted, without more success, to bombard the French lines, but they were received in style and fled hurriedly. Lastly, a Taube flew over the British lines, and, being similarly received, also fled. In view of these attempts General Sarraill yesterday (February 16) gave orders for reprisals. At half past two sixteen bombarding aeroplanes visited Strumnitza. They returned the same evening, having accomplished their mission. One of the aviators states:

"Well assisted by the wind, we crossed the eighty miles necessary. We were flying at 6,000 ft. The cold was very keen, and we were several times shot at without result. Six aeroplanes flew over the station and the Bulgarian depots and camps, throwing eighty heavy shells, and starting several fires. Nine others went over the town of Strumnitza, and bombarded it at points which had been indicated in advance, several being hit. Some shops and several military barracks were set on fire. There, too, we were violently bombarded, but without result, by special batteries. Half an hour after reaching the town the whole squadron started back, and got home without the slightest mishap."

A hundred and sixty-five bombs were dropped, with important results, of which photographs were taken. During the bombardment the French were attacked by a squadron of German machines. One French aviator was slightly wounded.

February 17—French Air Success at Salonika—One of the most modern types of German Aviatik biplanes was brought down by a French aeroplane at Karasuli, north of Salonika, this morning (February 17). The latter, manned by two very young aviators, sighted

their adversary while on patrol. They chased him, and opened fire with such effect that the enemy machine came down with a hole in its petrol tank and the observer lying back in his seat with five bullets in his thigh. The German pilot sprang from the driving seat while the Frenchmen were still circling to land, and, throwing away his cap and kicking off his heavy fur-lined boots, he ran off across country and was lost to sight. The captured aeroplane is quite undamaged, and will be exhibited in the street to the public of Salonika, like the last one. A cavalry patrol is scouring the country for the runaway German. General Sarraill has given the Legion of Honour to the pilot of the French machine and the Military Medal to his observer.

February 22—The wounded observer of the German Aviatik which was forced down at Karasuli, north of Salonika, on February 17, has died, though he was hurried by special train to hospital. The pilot, who made off across country, has been captured.

EAST INDIES

February 14—**General Killed in the Air**—General Michielsen, commanding the troops in Java, went up to-day (February 14) in an aeroplane piloted by Air-Lieutenant Terpoortcn, near Krawang. The machine fell, the general being killed and the pilot severely injured. The machine had been rebuilt from an American waterplane.

HOLLAND

February 16—**Zeppelin Lands in Holland**—Reports according to which a Zeppelin airship has come down somewhere to the north of Venloo are not yet confirmed. Military patrols have been sent out but so far have discovered nothing.

(Venloo is in the Dutch province of Limburg, within two miles of the German frontier. Düsseldorf, where there are Zeppelin sheds, is only thirty miles away.)

PROGRESS AT THE FLYING SCHOOLS

The London and Provincial School.—Instructors: W. T. Warren, M. G. Smiles, C. M. Jacques, H. Sykes, and W. T. Warren, jun. Pupils doing rolling: Archer, Hay, Ledure, Dawson, Houba, and Aldous. Pupils doing straights: Palethorpe and Vertongen. One pupil doing circuits and eights. The weather has been most unfavourable for school work this week, only about two hours being suitable for practice.

The Grahame-White Civilian School.—Straights with instructor: Baragar, Butler, Hillaby, Rigby, Schedit, and Tanner. Instructors during week: Hale, Biard, Manton, Pashley, Russell and Winter. Further practice impossible owing to bad weather.

The Ruffy-Baumann School.—Instructors for the week: Edouard Baumann, Felix Ruffy, Ami Baumann, and Clarence Winchester. Pupils with instructor: Winter, Westlake, Dobson, Bolton, Wood, D'Opstael, Thomson, Laidlaw, and Cuthbertson. Straights or circuits: Thomson, Laidlaw, Cuthbertson, and D'Opstael. Machines in use: 50 and 60 h.p. Ruffy-Baumann tractor biplanes.

The Hall School.—The following pupils were out during the week receiving instruction:—With C. M. Hill: Ormerod, Arnsby, Dodds, Lieut. Cooke, Smith (1), Collins, Thom. With J. Drew: Millburn, Chapman, Rochford, Smith (2), Roberts, Neal. With A. Clave: Worswick, Halliday, Longton, Rayne, Collier, Duncan, Mahoney, Taylor. Machines in use: Hall Government-type tractors.

HONOURS FOR THE AIR SERVICES

ROYAL FLYING CORPS

The *London Gazette* of February 24 stated:—"The President of the French Republic has bestowed the decoration of the Legion of Honour, with the approval of His Majesty the King, on the following officers and men, in recognition of their distinguished service during the campaign":—

LEGION OF HONOUR

Croix d'Officier

Maj. and Brevet Lieut.-Col. (temporary Brig.-Gen.) W. S. Brancker, R.A.

Croix de Chevalier

Capt. and Brevet Maj. (temporary Lieut.-Col.) J. H. W. Becke, Nottinghamshire and Derbyshire Regt. and R.F.C.

Capt. (temporary Lieut.-Col.) G. W. P. Dawes, Royal Berkshire Regt. and R.F.C.

Capt. J. T. C. Moore-Brabazon, R.F.C. (Special Reserve).

Lieut. (temporary Capt.) H. R. Nicholl, R.F.C. (Special Reserve).

Temporary Second Lieut. (temporary Capt.) E. D. Horsfall, Rifle Brigade and R.F.C.

Croix de Guerre

1194 First Class Air Mech. A. J. Bradford, R.F.C.

886 Serg. R. G. Brobson, F.F.C.

2891 Serg. F. T. Courtney, R.F.C.

814 Serg. W. V. Ellison, R.F.C.

1629 Serg. A. Randle, R.F.C.

Medaille Militaire

555 Serg. A. A. J. Beer, R.F.C.

152 Flight Serg. F. James, R.F.C.

251 Serg.-Maj. J. Kemper, R.F.C.

4917 Second Class Air Mech. F. S. Mackrell, R.F.C.

7146 Corp. R. S. Northoote, R.F.C.

ROYAL NAVAL AIR SERVICE

DISTINGUISHED SERVICE ORDER

Flight Sub-Lieut. Charles Walter Graham, R.N.

For his services on December 14, 1915, when, with Flight Sub-Lieut. Ince as observer and gunner, he attacked and destroyed a German seaplane off the Belgian coast.

DISTINGUISHED SERVICE CROSS

Capt. Dudley Leigh Aman, R.M.A.

For his services with the Royal Marine Artillery Anti-Aircraft Brigade. Capt. Aman has commanded two sections of anti-aircraft guns in the salient of Ypres continuously since May 3, 1915, with marked success, and has shown great ability and zeal, and a fine example of coolness and courage under fire.

Temporary Capt. Guy Evans, R.M.

For his services with the Royal Marine Artillery Anti-Aircraft Brigade. Capt. Evans has commanded a section of anti-aircraft guns in the salient of Ypres continuously since May 12, 1915, and has shown an example of conspicuous coolness and courage on every occasion under the continual conditions of fire to which the section has been exposed.

Flight Sub-Lieut. Arthur Strachan Ince, R.N.

For his services as observer and gunner on December 14, 1915, when with Flight Sub-Lieut. Graham he attacked and destroyed a German seaplane off the Belgian coast.

DISTINGUISHED SERVICE MEDAL

Petty Officer Mech. S. Crisp, O.N. F.956.

Petty Officer Mech. M. A. Lockie, O.N. F.1075.

CASUALTIES

ROYAL NAVAL AIR SERVICE

February 15

DROWNED

Page, Flight Sub-Lieut. Herbert J., R.N.

Lee, Flight Sub-Lieut. Bernard R., R.N.

February 18

SERIOUSLY INJURED

Angus, Probationary Flight Sub-Lieut. Thomas C., R.N.

February 20

KILLED

Toms, Probationary Flight Sub-Lieut. Francis H., R.N.

(It is stated in an obituary notice that the above officer met his death at the Chingford Aerodrome.)

February 21

KILLED

Usborne, Commander Neville F., R.N. (Wing Commander, R.N.).

Wing Commander Neville Florian Usborne, R.N., was killed accidentally on February 21. He became a midshipman in September, 1898, and in qualifying for the rank of lieutenant won the Ryder Memorial Prize, which is awarded to the sub-lieutenant who passes the best examination in French at the Royal Naval College. He specialised as torpedo lieutenant, and in submarine duties, and in 1905 qualified as an interpreter in German. He was appointed to the *Hermione* for service with airships in September, 1910, where he remained until January, 1912. In April of that year he became squadron commander, Naval Airship Section, Royal Flying Corps, and in October, 1913, was given the command of Naval Airship No. 3. He was promoted commander and wing commander in June, 1914. In one sense the late Commander Usborne may be said to have been the moving spirit of the airship branch of the Royal Naval Air Service. He was in command, as navigator, of the ill-fated first naval dirigible, the *Mayfly*, which was wrecked at Barrow in 1911 on the occasion of its first trial. He was, as his record shows, an accomplished technical man; his knowledge of airships and their technique and management was extraordinarily wide and thorough. He was, besides, an accomplished balloonist, airship and aeroplane pilot. The latter certificate he obtained on a Caudron at Hendon on April 1, 1913. His loss, and more particularly the stupid way in which it was incurred, will be deeply deplored, not only by his many friends but by the whole British world of aviation, which to the end remained only too little cognisant of his merits and achievements, which were always hidden beneath the impenetrable veil of the seaman's silence and reserve.

Ireland, Lieut.-Commander de Courcy W. P., R.N. (Squadron Commander, R.N.).

Lieut.-Commander de Courcy Wyndor Plunkett Ireland entered the Navy as a cadet in September, 1901, and was promoted sub-lieut. in November, 1904, and lieut. in 1906. He became lieut.-commander in February, 1914, and squadron commander in May of last year. He obtained his pilot's certificate, No. 676, on November 1, 1913, on a Bristol biplane at Eastchurch. His work, especially since the outbreak of war, has been invaluable. It was Ireland, by the way, and a right good fellow he was, who was the pilot who was the first to loop the loop on a Maurice Farman. A wind-gust turned his machine right over, and when, after the lapse of ten seconds or so, he began to think that, according to his own version of the affair, it was time to undo his strap and climb out of the crucible on to the upper plane, the machine suddenly righted itself, and he came down safe and sound. *Experto crede.*

February 25

INJURED

Francis, Flight Sub-Lieut. L., R.N.

February 27

UNOFFICIALLY ANNOUNCED KILLED

Roshier, Flight Lieut. H., R.N.A.S.

Flight Lieut. Roshier was gazetted as a probationary flight sub-lieut. only a fortnight after the outbreak of war, and was confirmed as flight sub-lieut. in the following November. He was gazetted flight lieut. on December 31, 1914. He was one of the 34 pilots who took part in the successful air raids on Ostend and Zeebrugge in February, 1915, and in March he was one of the six pilots who engaged in the air raid on Ostend and the subsequent raid at Hoboken, near Antwerp. Lieut. Roshier was one of the first batch of pupils who joined the R.N.A.S. soon after the outbreak of war. He took his certificate at the Grahame-White School at Hendon soon after, and rapidly developed into one of the finest pilots of the Air Service. A charming personality, his premature death will be widely and deeply regretted. For the last 15 months and more Flight Lieut. Roshier had been constantly engaged on reconnaissance and patrol work, and had one memorable encounter with a Zeppelin. He was only 22 years of age, and had had no experience of flying until the outbreak of war.

ROYAL FLYING CORPS

KILLED

Cave, Second Lieut. Eric A., R.F.C.

Second Lieut. Eric A. Cave, R.F.C., who was 22 years of age, was the only son of Mr. Arthur Cave, of Rushden, manager of the Standard Rotary Machine Co. He had been at the front only eight or ten days when he was killed. He was an accomplished linguist, speaking French, German, and Italian fluently, and he had travelled extensively in Italy and Germany. A journalist of considerable promise, he had occupied positions on the staffs of the *Northampton Daily Echo* and the *Northampton Independent*, and at the time of his enlistment he was on the editorial staff of the *Yorkshire Observer*.

(A notice of Second Lieut. Cave's death appeared in our issue of February 23.)

PREVIOUSLY REPORTED MISSING, NOW REPORTED DIED OF WOUNDS AS A PRISONER

Browne, Lieut. A. R. H., R.F.C.

Mesopotamia
MISSING

Palmer, 4473 Serg. T. N.

Pass, 3318 Second Class Air Mech. W. C.

UNOFFICIALLY REPORTED KILLED

February 17

Wadham, Capt. V. H. N., R.F.C. and 1st Bn. Hampshire Regt.

Capt. Vivian Hugh Nicholas Wadham, R.F.C. and 1st Bn. Hampshire Regt. (killed in action in Flanders over the German lines on February 17), was aged 24, eldest son of Mr. and Mrs. Hugh D. Wadham, of Thamesfield, Shepperton-on-Thames. He entered the Hampshire Regt. from the Special Reserve in June, 1914, and was promoted lieutenant in the following December. In May of last year he was appointed flight commander in the Military Wing of the Royal Flying Corps, with the temporary rank of captain.

PREVIOUSLY UNOFFICIALLY REPORTED PRISONER, NOW OFFICIALLY REPORTED WOUNDED AND PRISONER

McEwan, Second Lieut. J. G., R.F.C.

February 20

WOUNDED

Collins, Second Lieut. C. H., 13th Royal Warwickshire Regt. and R.F.A.

MISSING

Garlick, Second Lieut. F. A., R.F.C.

Knox, Capt. W., 3rd Cameron Highlanders and R.F.C.

Undated

WOUNDED

Hudson, Second Lieut. F. N., Buffs (East Kent Regt.) and R.F.C.

INQUEST ON SECOND-LIEUT. E. J. RADCLIFFE, R.F.C.

Mr. Gilbert H. White, Coroner for West Surrey, held an inquest at Byfleet Village Hall on February 22 upon the body of Second Lieut. Ernest John Radcliffe, R.F.C., 21, of Duke's Avenue, Muswell Hill, who was killed whilst flying at Brooklands on Sunday (February 20), his machine striking a house as it fell to the ground and being completely burned.

Major Andrew George Board, commanding the Royal Flying Corps at Brooklands, said the deceased had been there since January 15, when he was gazetted. He had passed through the elementary flight, and was considered quite competent to fly by himself, which he had done for just over an hour in two or three different flights. Second Lieut. Cyril Edgar Foggin, flight commander, said he was himself in the air when deceased started his fatal flight about 4 o'clock on Sunday afternoon. Deceased was flying a new Maurice Farman biplane, which witness had flown on the previous day and found to be perfectly all right. When witness landed deceased was 100 ft. up, preparing to land. He made a right turn, banking to an angle of 30 or 40 degrees. Then, instead of coming to the horizontal he increased his bank, and the machine side-slipped to the ground. For the last 60 ft. a smash was inevitable. Had he been higher up deceased would probably have been able to regain control. The machine struck a cottage in falling and burst into flames.

The jury returned a verdict of accidental death.

APPOINTMENTS

ROYAL NAVAL AIR SERVICE

Squadron Commander:

H. L. Woodcock, appointed Acting Wing Commander (temporary): February 12.

Flight Commanders:

J. R. W. Smyth-Pigott, D.S.O., appointed Acting Squadron Commander, with seniority of February 1.

E. R. C. Nanson, appointed Acting Squadron Commander (temporary): February 6.

Assistant Paymaster, R.N.:

D. R. Thurstan, to the *President*, additional, for R.N.A.S., as Acting Flight Lieut.: February 12.

The undermentioned have been entered as Probationary Flight Sub-Lieuts. (temporary), and appointed to the "*President*," additional, for R.N.A.S., with seniority as follows:

E. B. Waller: November 8, 1915.

W. E. Orchard, J. L. Gordon, and G. R. Hodgson: January 18.

R. W. Winter and N. M. Macgregor: February 12.

H. C. Randall-Stevens and C. S. Hay: February 28.

Late Second Lieut. (A.S.C.) D. R. Baylis, entered as Probationary Flight Sub-Lieut. (temporary), with seniority of February 17, and appointed to *President*, for R.N.A.S.

Flight Lieut.:

E. I. M. Bird, granted a temporary commission as Lieut. (R.N.V.R.), with seniority of February 15.

A. Brind: March 7.

J. B. R. Swan, entered as Temporary Lieut. (R.N.V.R.), with seniority of February 22, and appointed to the *President*, for R.N.A.S.

Temporary Lieut. (R.N.V.R.):

W. H. Wood, entered as Temporary Flight Sub-Lieut. (R.N.), with seniority of February 15, and appointed to the *President*, additional.

H. J. T. Berryman, granted a temporary commission as Lieut. (R.N.V.R.), with seniority of February 15, and appointed to the *President*, additional, for R.N.A.S.

A. Garrard, granted a temporary commission as Lieut. (R.N.V.R.), with seniority of February 19, and appointed to the *President*, additional, for R.N.A.S. (February 27).

To be Temporary Flight Sub-Lieut.:

William H. Wood (late temporary Sub-Lieut., R.N.V.R.): February 15.

Sub-Lieuts. (R.N.V.R.) (Temporary):

N. D. M. Hewitt and J. E. A. Hoare, both as Probationary Flight Sub-Lieuts., temporary, with seniority of February 18, and appointed to the *President*, additional, for R.N.A.S.

F. A. Brooke, as Probationary Flight Sub-Lieut., temporary, with seniority of February 27, and appointed to the *President*, additional, for R.N.A.S.

G. A. Hoghton (late Temporary Lieut., R.N.V.R.), re-entered as Lieut. (temporary, R.N.V.R.), with seniority of February 18, and appointed to the *President*, additional, for R.N.A.S.

Temporary commissions as Lieut. (R.N.V.R.), with seniority of February 18, have been granted to W. A. D'Arcy, T. C. Copson, and J. B. Handley-Seymour, and all appointed to the *President*, additional, for R.N.A.S.

ROYAL FLYING CORPS

The following appointments are made:—

Brigade Commanders, from Wing Commanders, R.F.C., and to be Temporary Brig.-Gens. while so employed:

Maj. (temporary Lieut.-Col.) J. M. Salmond, D.S.O., Royal Lancashire Regt., and Maj. (temporary Lieut.-Col.) T. I. Webb-Bowen, Bedfordshire Regt.: February 1.

Second Lieut. (temporary Lieut.) H. G. Trust, R.F.C., Special Reserve, is transferred to General List for special duty: August 17, but with seniority as from August 4.

Temporary A. L. Packham relinquishes his commission: January 4.

Squadron Commander:

Capt. V. A. Barrington-Kennett, Special Reserve, from a Flight Commander, and to be temporary Maj. whilst so employed: February 1.

CENTRAL FLYING SCHOOL

Instructor Lieut. (temporary Capt.) Gerald D. Mills, Sherwood Foresters (Nottinghamshire and Derbyshire Regt.), a Flight Commander, and to retain his temporary rank whilst so employed, vice Capt. (temporary Maj.) L. W. B. Rees, R.A.: February 4.

Flight Commanders:

Capt. S. C. Raffles, 3rd Bn. Royal Welsh Fusiliers, Special Reserve, from a Balloon Officer: January 29.

Second Lieut. V. A. H. Robeson, Special Reserve, from a Flying Officer, and to be Temporary Capt. whilst so employed: February 1.

Flight Commanders, from Flying Officers:

Second Lieut. Charles E. H. James, Welsh Regt., and to be temporary Capt. whilst so employed: January 25.

Maj. S. Smith, R.F.A., T.F., and Capt. T. A. E. Cairnes, 7th Dragoon Guards: January 28.

Capt. Cedric Y. McDonald, Seaforth Highlanders (Ross-shire Buffs, Duke of Albany's): February 8.

Temporary Capt. J. H. S. Tyssen, North Somerset Yeomanry, T.F.; Lieut. R. J. Tipton, R.F.A., T.F., and to be temporary Capt. whilst so employed; Lieut. Leonard H. Sweet, Hampshire Regt., and to be temporary Capt. whilst so employed; Temporary Lieut. H. A. Van Rynefeld, General List, and to be temporary Capt. whilst so employed; Lieut. Oliver D. Filley, Special Reserve, and to be Temporary Capt. whilst so employed; Second Lieut. Selden H. Long, Durham Light Infantry, and to be temporary Capt. whilst so employed: February 1.

Capt. Bernard E. Smythies, R.E., from an Equipment Officer: February 7.

Capt. Henry S. Walker, Cheshire Regt., from a Wing Adjutant; Second Lieut. Percy E. L. Gedlin, Special Reserve, and to be temporary Capt. whilst so employed: February 10.

Second Lieut. John P. C. Sewell, Special Reserve, and to be temporary Capt. whilst so employed: February 12.

Lieut. Basil C. McEwen, Special Reserve, and to be temporary Capt. whilst so employed: February 13.

Flying Officers:

Second Lieut. Phillips D. Rader, Special Reserve: December 28, 1915.

Second Lieut. (temporary Lieut.) N. P. Manfield, Northamptonshire Regt., T.F.; Temporary Second Lieut. E. S. Moulton-Barrett, Seaforth Highlanders, and to be transferred to General List; Temporary Second Lieut. S. H. Ellis, Northumberland Fusiliers, and to be transferred to General List; Temporary Second Lieut. C. H. Collins, Royal Warwickshire Regt., and to be transferred to General List; Second Lieut. T. R. Irons, Yorkshire and Lancashire Regt., Special Reserve, and to be seconded; Second Lieut. J. J. Lynch, Special Reserve; Second Lieut. L. Minot, Special Reserve; Second Lieut. A. H. O'H. Wood, Special Reserve; Second Lieut. J. C. Cunningham, Special Reserve: February 1.

Lieut. D. B. Richardson, Welsh R.E., T.F.; Lieut. R. B. Mansell, Gloucestershire Regt., T.F.; Second Lieut. C. T. Latch, R.G.A., T.F.; Second Lieuts., Special Reserve, Ronald True, Rodney W. Heath, John R. B. Savage, Arthur G. Knight, Edward G. Ryckman, John W. Bailey, and Leslie Porter: February 3.

Capt. Henry S. Walker, Cheshire Regt.; Lieut. C. G. Davidson, Canadian Local Forces; Temporary Second Lieut. A. M. Walters, 14th Reserve Regt. of Cavalry, and to be transferred to the General List; temporary Second Lieut. J. N. MacRae, Black Watch (Royal Highlanders), and to be transferred to the General List; Temporary Second Lieut. J. S. Anderson, the Queen's (Royal West Surrey Regt.), and to be transferred to the General List; Second Lieut. Geoffrey V. Randall, East Lancashire Regt., and to be seconded; Temporary Second Lieut. J. R. Herbert, General List; Second Lieut. R. J. Mounsey, Hampshire Regt., and to be seconded: February 5.

Temporary Capt. D. M. Rawcliffe, Manchester Regt., T.F.; Second Lieut. O. A. Westendarp, London Regt., T.F.; Second Lieut. R. D. Vavasour, R.F.A., Special Reserve; Second Lieut. J. W. Gordon, Special Reserve; Second Lieut. W. B. Young, Special Reserve: February 8.

Capt. A. S. M. Summers, 19th Hussars; Lieut. H. S. Mackay, Hampshire R.G.A., T.F.; Second Lieut. H. G. Corby, Royal Munster Fusiliers, and to be seconded; Second Lieut. W. S. R. Bloomfield, Special Reserve: February 10.

Second Lieut. Denis O. Mulholland, Connaught Rangers, Special Reserve, and to be seconded; Second Lieut. Geoffrey W. Bavin, Lincolnshire Regt., and to be seconded: February 12.

Flying Officers (Observers):

Lieut. R. C. Gill, R.A., and to be seconded; Second Lieut. (temporary Lieut.) C. J. Orde, A.S.C., Special Reserve; Temporary Second Lieut. H. H. James, Somerset Light Infantry, and to be transferred to the General List; Second Lieut. H. Hewett, Royal Berkshire Regt., and to be seconded: October 21.

Temporary Lieut. H. V. Stammers, Motor Machine Gun Service, and to be transferred to General List: November 8.

Second Lieut. E. A. Floyer, Indian Army Reserve of Officers; Second Lieut. V. A. Stookes, 2nd Dragoons, Special Reserve; Temporary Second Lieut. G. Mortimer, Connaught Rangers, and to be transferred to General List; Temporary Second Lieut. I. G. Davies, Royal Welsh Fusiliers, and to be transferred to General List.

Temporary Second Lieut. A. M. Lowery, R.A., and to be transferred to General List: February 9.

Balloon Officers:

Capt. F. M. Roxby, North Staffordshire Regt., Special Reserve, and to be seconded, and Second Lieut. J. S. D. Berrington, Lancashire Fusiliers, T.F.: January 20.

Equipment Officer:

Second Lieut. G. P. Grenfell, Special Reserve, from an Assistant Equipment Officer, and to be temporary Capt. whilst so employed: January 30.

Equipment Officers, from Assistant Equipment Officers, and to be temporary Capts. whilst so employed:

Qmr. and Hon. Lieuts. J. Sarling, A. Levick, A. H. Measures, F. H. Unwin, and W. R. Bruce; Temporary Qmr. and Hon. Lieut. S. C. Parr, Lieuts. (Special Reserve) L. F. R. Fell, T. E. Robertson, and S. A. Hebden.

Assistant Equipment Officers:

Second Lieut. Victor F. P. Bryce, Special Reserve: October 11, 1915.

Second Lieut. O. V. Thomas, Special Reserve: January 21.

Second Lieut. Henry P. Boot, Special Reserve: January 20.

Second Lieut. J. G. Hutt, Special Reserve: January 28.

Second Lieut. E. W. Vaughan, Special Reserve: February 3.

Second Lieut. John A. Gibson, Special Reserve: February 4.

Second Lieut. Lionel A. Clayton, Special Reserve: February 7.

Second Lieut. John Armes, Special Reserve: February 9.

To be Temporary Second Lieuts. for Duty with R.F.C.:

Corp. J. A. Turnbull, from Scottish Horse Yeomanry, T.F.: January 22.

Corp. Edgar R. Moxey, from R.E., for duty with the R.F.C.: February 7.

Serg. H. M. Bentley, from H.A.C.: February 10.

Hampshire Aircraft Parks

W. Scott Farren to be Second Lieut. (on probation): February 27.

SPECIAL RESERVE

The appointment of A. J. Rickie to a Second Lieutenancy (on probation) which appeared in *Gazette* of January 17, is cancelled under the Regulations for Officers of the Special Reserve: February 20.

Second Lieuts. on probation confirmed in their rank:

J. C. Cunningham, J. G. Hutt, O. V. Thomas, E. W. Vaughan, Ronald True, Rodney W. Heath, John R. B. Savage, Laurence Minot, Arthur H. O'H. Wood, Edward G. Ryckman, Arthur G. Knight, Leslie Porter, John W. Bailey, John A. Gibson, Lionel A. Clayton, J. J. Lynch, V. F. P. Bryce, Leonard C. Kidd, Phillips D. Rader, and John Armes.

J. W. Gordon, W. B. Young, W. S. R. Bloomfield, and H. P. Boot.

To be Second Lieuts. (on probation):

Ernest Graham: January 17.

Stanley Whitechurch and John F. Luscombe: January 24.

F. Hitchings: January 26.

S. S. Dixon and R. A. Delhaye: January 31.

O. C. Morison: February 18.

W. B. Sherwood and R. Buck: February 20.

The appointment of R. M. Motabhoj to a Second Lieutenancy (on probation), which appeared in *Gazette* of January 5, is cancelled as from February 19.

Serg. Alfred E. Neale, from Herts Yeomanry, T.F., to be temporary Second Lieut. for duty with the R.F.C.: February 3.

OFFICIAL NOTICES

THE ROYAL AERO CLUB OF THE UNITED KINGDOM

ANNUAL GENERAL MEETING

The Annual General Meeting of the members of the Royal Aero Club of the United Kingdom will be held on Tuesday, March 28, 1916, at Piccadilly, London, W.

Notices of motion for the Annual General Meeting must be received by the Secretary not less than 21 days before the meeting, and must be signed by at least five members. The last day for the receipt of notices of motion is Tuesday, March 7, 1916.

COMMITTEE

In accordance with the rules, the Committee shall consist of 18 members. Members are elected to serve for two years, half the Committee retiring annually. Retiring members are eligible for re-election.

The retiring members of the Committee are:—

Lieut.-Col. R. K. Bagnall-Wild, R.E.

Lieut.-Col. W. D. Beatty, R.E.

G. B. Cockburn.

Lieut.-Col. F. Lindsay Lloyd.

Capt. J. T. C. Moore-Brabazon, R.F.C.

Com. C. R. Samson, R.N., D.S.O.

A. Mortimer Singer.

T. O. M. Sopwith.

The Marquess of Tullibardine, M.V.O., D.S.O., M.P.

Any two members of the Club can nominate a member to serve on the Committee, provided the consent of the member has been previously obtained. The name of the member thus nominated, with the names of his proposer and seconder, must be sent in writing to the Secretary not less than 14 days before the Annual General Meeting. The last day for the receipt of nominations is Tuesday, March 15, 1916.

SPECIAL COMMITTEE MEETING

A Special Meeting of the Committee was held on Tuesday, when there were present:—Prof. A. K. Huntington, in the chair, Mr. Griffith Brewer, Mr. Ernest C. Bucknall, Flight Commander C. F. Pollock, R.N., and the Assistant Secretary.

ELECTION OF MEMBERS

The following new members were elected:—

Second Lieut. George Purvis Bulman, R.F.C.

Hubert Frank Fisher.

Douglas Cavley Hutchinson.

Reginald Thornycroft Vernon.

ROYAL SOCIETY OF ARTS—Wednesday, March 8, 4.30 p.m. (Ordinary Meeting.) Charles R. Darling, A.R.C.Sc.I., F.I.C., "Optical Appliances in Warfare." Dr. R. T. Glazebrook, C.B., F.R.S., Director of the National Physical Laboratory, will preside.

THE INSTITUTION OF AUTOMOBILE ENGINEERS—The next meeting of the Institution of Automobile Engineers will be held on Wednesday, March 8, 1916, at the Royal Society of Arts, John Street, Adelphi, W.C., at 8 p.m., when Mr. J. Lawrence Hodgson, B.Sc., A.M.Inst.C.E., will read a paper entitled "The Fan Dynamometer." Cards of invitation to the meeting may be obtained on application to the Secretary of the Institution, 28, Victoria Street, London, S.W.

SOCIAL INTELLIGENCE

MILLS—DE BRATH—On Sunday, February 20, Percy Harman-Mills, R.N.A.S., youngest son of Walter Thomas Mills, to Vera De Brath, second daughter of Lieutenant-General Sir E. De Brath, K.C.B., C.I.E. (retired), Indian Army.

LEGAL NEWS

WORKMAN'S STUPID HOAX—Howard Percival Smith, 26, was fined £5 at West Bromwich on February 21 for spreading a false report to the effect that he had received information by telegram that Zeppelins were in the neighbourhood. He was employed by a firm of rolling-mill engineers, and a panic was caused at the works. But for the intervention of the foreman, in fact, the men would have ceased work. The defendant admitted to the police that it was a hoax.

PATENT INFORMATION

This list is specially compiled for AERONAUTICS by Messrs. Rayner and Co., Registered Patent Agents, of 5, Chancery Lane, London, from whom all information relating to Patents, Designs, Trade Marks, etc., can be obtained gratuitously.

LATEST PATENT APPLICATIONS

- 1,731 J. Cavagna. Captive balloons, etc., for attacking aircraft 5/2/16.
- 1,740 L. Coatalen. Gun-carrying aeroplanes, etc. 5/2/16.
- 1,703 W. Kerr. Aerial projectiles. 4/2/16.
- 1,710 V. Keuller. Apparatus for defence against aircraft attacks 4/2/16.
- 1,618 F. W. Lanchester. Searchlights and apparatus for detection of aircraft. 3/2/16.
- 1,962 W. A. Abbott. Aircraft range-finder and spotting instrument. 10/2/16.
- 2,103 M. Bellassie. Aviation. 12/2/16.
- 1,996 N. Chenky. Means for destroying aircraft. 10/2/16.
- 2,094 P. H. Ledeboer. Carriage for anti-aircraft guns. 12/2/16.
- 2,043 Porter. Aeronautical machines.
- 2,960 Austin. Propeller for aeroplanes, and the like.

SPECIFICATIONS ACCEPTED

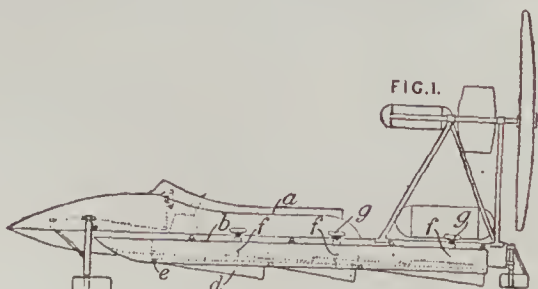
- 2,943 Porter. Aeronautical machines.
- 2,960 Austin. Propeller for aeroplanes and the like.

SPECIFICATIONS PUBLISHED THIS WEEK.

- 1,188 Vickers, Ltd., & Pratt. Swivelling gear for the propellers of airships.
- 5,862 Short. Valves for aerostats.
- 8,589 Shimmin. Bomb for aero-maritime warfare.
- 14,376 Vasseerot. Sighting apparatus for use in discharging bombs from aircraft.

LATEST PUBLISHED ABSTRACTS

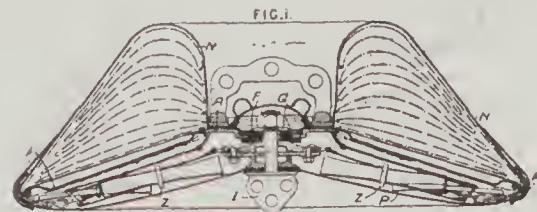
- 21,140 "Hydroplane Vessels." Soc. Anon. des Etablissements Nieuport, 46 Boulevard du Point du Jour, Issy-les-Moulineaux,



Seine, France. A vessel with a central main hull, *a*, having on its lower surface a series of fixed inclined planes, carries side floats, *b*, to which is pivoted at the points *e* wedge-shaped elements, *d*, which may be raised or lowered independently and differentially by the screws *f* and wheels *g*. The vessel is driven by an air propeller.

- 21,312 "Parachutes." E. R. Calthrop, Eldon Street House, Eldon Street, London. An annular frame *A* suspended from the aircraft is provided with a conical flange *B* on

or within which the fabric of the parachute is pleated and folded and is then enclosed in a flexible waterproof casing *N*. The cords by which the trapeze is suspended from the fabric are preferably in the form of tapes, and these are folded and arranged radially upon a lower waterproof casing *P*, which is then detachably connected to the upper casing. The fitting *i* to which the trapeze is attached is supported by a pair of rubber washers *F*, *G*, gripping at their edges a flange on the supporting frame *A*. When the aviator's weight comes on the trapeze these washers are dragged away from the flange.



and the lower casing *P* falls, tension being put upon the folded tapes, which are evenly drawn out against frictional resistance caused by rubber rings *Z* encircling the folds. The folds of the fabric are then successively drawn out, from the peripheral to the central fold, whereby a gradually increasing atmospheric resistance under the fabric is experienced.

Full copies of the specification can be obtained from Messrs. Rayner & Co., at the price of 1s.

A NEW TRIPLEX WIND SCREEN

The accompanying photograph depicts a new "Auster-Triplex" V-shaped aeroplane wind-shield (Model 4). It is a new and



NEW TRIPLEX WIND SCREEN.

special design and has recently been largely adopted. The extreme width is 22 inches, the weight is 3 lb. 7 oz., and the panels, needless to say, are of Triplex safety glass, $\frac{1}{8}$ in. thick.

ROYAL AIRCRAFT FACTORY WAR DISTRESS RELIEF FUND

REPORT AND BALANCE SHEET FOR THE FIRST YEAR'S WORKING

On Friday, February 4, a meeting of the contributors to the above Fund was held in the R.A.F. Mess Room. The President of the Fund, Lieutenant-Colonel M. O'Gorman, C.B., S.R.A.F., was in the chair, supported by the Chairman of the Fund, Treasurer, Secretary, and members of the Committee.

The President expressed his satisfaction with the results shown on the balance-sheet, and congratulated the contributors on the success they had attained during the year under review. He gave extracts from some of a large number of letters of thanks and appreciation received from the charitable organisations to which the fund had contributed, and he pointed out that these letters were evidence of the really good work the Fund was doing.

After further remarks, the President expressed his conviction that the members would proceed to still further efforts in the pursuit of their work. At the close of the meeting the Chairman proposed a hearty vote of thanks to the President for his kindness in devoting such an appreciable portion of his already overpressed time. This was carried heartily.

COMPANY NEWS

(A.I.R.) AVIATION INVESTMENT AND RESEARCH, LTD.—Meeting of members at 1, Broad Street Place, London, E.C., March 16, to receive liquidator's report.

AERONAUTICS

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ONE PENNY

THE APOLOGIST

IN strenuous times such as we are living through to-day, when every ounce of effort and every fraction of skill must, willy-nilly, be brought to aid the furtherance of the great cause, old domestic controversies are apt to be forgotten, and blessed be he who consigns them to oblivion. For the years are many, after the war, when, in enforced semi-idleness, we may reopen them with profit. Also, he who at the present somewhat critical moment wantonly challenges discussion on matters which cannot bring the effective conclusion of the war any nearer, and can only arouse bitter recrimination, is simply inviting vituperation. Moreover, he has amply earned it. We fondly hoped—speaking purely of aerial matters—that the political hatchet had been buried for the nonce. But a recent article in the *Times Engineering Supplement*, which purports to voice authoritative views, deliberately goes out of its way to rouse ghosts long since laid by the engine-rating influence of the war, and insolently, as the champion of the Government, flings down the gauntlet to the aviation industry. The challenge is accepted.

Signed by one "Ornis," a pseudonym whose mystery is far from impenetrable, this article in its essence constitutes the *apologia pro vita sua* of the Royal Aircraft Factory, its ramifications, and its servile myrmidons, and embodies a somewhat virulent attack on the "frivolous disparagement which amusing aero-amateurs occasionally see fit to pour on the serious efforts of the Services to improve the aeroplane for purposes of war." We hold no brief for either party, being merely concerned with examining the facts brought forward in the attempt to justify the plea in question.

And, firstly, it may be observed that in no responsible quarter have the efforts of the Services ever been disparaged. A statement of this nature can only be intended deliberately to confuse the issue, for such attacks as have been made in connection with the design and supply of aeroplanes, and the treatment of the industry in the past, have been levelled not at the Services, but at a parasitic growth thereof, namely, the Royal Aircraft Factory. In days gone by we have always endeavoured to lay stress upon the excellent work carried out both by the R.A.F. and the Advisory Committee through the medium of the National Physical Laboratory, and hence we can claim to be in entire agreement with the statement of the writer in question, that: "Science, research, calculation, study and measurement of results are taking the premier place in England. . . ." So far, so good; but why the totally unnecessary sneer at the "regrettable inactivity of the Aeronautical Society"? The reason for this inactivity is perfectly well known to "Ornis," and consists simply in the diversion of the energies and abilities of by far the greater proportion of the Society's members into channels more immediately fruitful to the prosecution of the war than the elucidation of the \sin^2 law, or even of the n^2 law.

Criticism is only justified when the grounds on which it is based can be substantiated in fact. Let us see, therefore, how well equipped is our critic's knowledge for the task he has taken in hand. First, as regards his premises. "The curiosity," states he, "of twenty-eight hours' air endurance . . . all belong to a date antecedent to the war." If the reference, as is obvious from the context, is to aeroplane performances, it is wrong by some four hours; the longest endurance flight on record being a few minutes over the twenty-four-hour mark. Again: "The monoplane, beloved of ladies and of the aero-amateur, has, since flying escaped from their sentimental and sensational influence, definitely left the British camp, and this occurred during the past year."

This statement, apart from the cheap sneer which it contains, is simply and definitely untrue. Monoplanes are not only still in active use by the British Air Service, not to mention the French and the Italians, but the supply of this type of machine is still being continued. Do you remember the recent Fokker myth, which was first exposed in these pages, an exposition which has subsequently been re-echoed in many a belligerent country? Well, the Fokker was simply a graceless and inferior copy of the French Morane monoplane. Our specious "Ornis" proceeds to bolster up his case with an even more unveracious assertion. "It is noteworthy," to quote our worthy scribe, "that though the last few monoplanes we used were of a French design *and build* (italics are ours), our plucky Allies preferred not to use them." The direct opposite is the fact; not only are we still using monoplanes, not only are the French still using monoplanes—as our readers have good cause to know—not only are the Italians reverting to the use of monoplanes, but within the last few months *British-built* monoplanes have been supplied to the British Air Service.

Let us continue our examination of the soundness, or otherwise, of this author's premises. Portentously he exclaims: "Having seen the Germans using two-engined aeroplanes, we demanded them—a sign of progress—and we are beginning to have them—yet more progress." Sheer nonsense, this, and only excusable on the ground of ignorance. The twin-engined aeroplane was first produced in a practical form in England—may it be added that Ader in 1892, and Maxim in 1894, used twin engines? Subsequently, experiments were made with twin-engined machines in the United States, in France, and in Italy. It is a fact that the designs of the existing twin-engine German machine, or its immediate precursor, were known to our authorities before the outbreak of war; it is a fact that the first *successful* twin-engined aeroplane was produced by the French, in the shape of the Caudron. But hold—even our good commentator admits his premise to be sadly at fault, for does he not assert, as an afterthought, that "even in Russia there were multi-engined aeroplanes in use before the war"? How now?

So here we come to the last point made, or attempted to be made, by "Ornis." He points with pride and with somewhat unctuous self-satisfaction to the fact "that we now have single-seater scouts with engine aft," and that thereby we have reverted to the engine position in the earliest aeroplanes, a statement which is grossly misleading besides being totally inconsequent. The engine-aft position was incorporated, as he maintains, "in the earliest Voisin, the earliest Farman [which was a Voisin] . . . the first aeroplane made by the Bristol Company [which was a Farman] . . . and, strangely enough, in the first Wright." True enough, except in so far as the Wright is concerned—and be it observed that the latest Wright models, and indeed fully three-quarters of the machines now in use, including the vast majority of the R.A.F. productions, have their engines in front—but what does the point prove? It is at best useful only from the point of view of polemics. As well criticise the modern locomotive engine by comparing it with "Puffing Billy." And if the contention were well founded, if it were true that we have "reverted for the specific reason that the engine is behind," what has the R.A.F. to say for itself, or the Advisory Committee, or all our Government "experts," that they should have allowed themselves to be led astray these long years and designed and built tractors exclusively, and all owing to "the prejudices fostered by the fractional and dangerous 'knowledge' of the aero-amateur"? Surely our official apologist stands condemned by the words of his own mouth!

A Case for Investigation

Another one of our readers, who has earned the additional distinction of having been elected a member of the House of Commons, has favoured us with a card of invitation to a meeting organised by the egregious Aeronautical Institute of Great Britain, together with the accompanying literature. The meeting, be it added, is, to quote the inscription on the cards, "entirely restricted to members of the Houses of Parliament and to members of the Institute." On repeated occasions I have previously felt compelled to deal with this so-called Institute, which recently broke into activity with an appeal, largely circularised, for funds in order to enable it to continue its self-imposed plan of campaign. I have publicly requested the Institute to publish a detailed programme of its existing and future—if the funds be forthcoming—activity; while monetary contributors would no doubt enjoy a glimpse of its balance-sheet. At any rate I, being a non-contributor, should. Hitherto no answer has been vouchsafed to these queries, the governing body of the concern having studiously refrained from sending any of its appeals or circulars to this office. The whole matter might have been allowed to drop, but for two facts. Firstly, the Institute and its secretary, one Blin Desbleds, are appealing for funds from the public purse—appeals which in this time of national economy should be more strictly scrutinised by the Treasury than appears to be the case—and secondly because Lord Montagu of Beaulieu is advertised (on the card of invitation) to take the chair at the meeting. Now, Lord Montagu is not only a sportsman, in the best sense of the term, and a gallant soldier, but is universally credited with authority in all questions pertaining to aviation. Hence I would only remind Lord Montagu that this Institute has not only not been countenanced by either the Royal Aero Club or the Aeronautical Society—the recognised bodies on aerial matters—but that it has been actually discountenanced.

On Experts

There is a mighty value in words—to the uninitiated. If words had souls and consciousness, many of the worst abused must have shrieked out their agony at the ill-treatment meted out to them. The invitation card to the private meeting of the Aeronautical Institute previously

referred to bears upon its face the following pregnant sentence: "Facts and data, indispensable for dealing with the aeronautical position, will be presented by experts." What more could an honest M.P., wholly ignorant of aerial lore, desire than to be pap-fed by alleged experts? An expert, according to a dictionary definition, is a person who is "skilful, ready, dexterous." The definition in the main aptly describes the tribe, whatever mental reservations we may make. Now, Major-General Sir David Henderson probably knows his aeronautical expert as well as any man living. Let us see what he has to say of him: "Any plausible rogue, gifted with sufficient assurance, and aided by a ready pen or a supple tongue, has been able to pose as an 'aeronautical expert,' and to find some kind of following. To those who, as a matter of duty, or in search of information, have perused the aeronautical discussions carried on in the Press, or the reports of such discussions elsewhere, the very word 'expert' calls up a strange procession of inventors, politicians, motor-trade touts, journalists, trick-fliers, novelists, and financial agents, most of them, axe in hand, on the way to the national grindstone." *Experto crede.*

A Designer Wanted

A large firm of aeroplane constructors has an excellent position for a first-class aeroplane and seaplane designer, and is prepared to offer to the right man a salary probably second to none in the aviation industry. I would point out that the position is one of great responsibility. Letters to this office, marked "Designer," will be duly forwarded.

New German Biplane

A new type of Aviatik biplane was recently brought down behind the French lines. Its wings are no longer swept back as in earlier types, and measure 41 ft. in span, with a chord of 6.1 ft. and a gap of 6.4 ft. The structure is of oval steel tubing throughout. The engine is a 170 h.p. Mercédès driving a Garuda tractor. The weight, empty, works out at 1,600 lb., and the useful load, including armament, amounts to approximately 1,300 lb. The machine, as one would expect from the heavy loading, is exceptionally fast, and has a climbing speed of some 4,000 to 4,500 ft. in fifteen minutes. But, though an apparently inexhaustible supply of machines and engines of ever-increasing size and improved efficiency is pouring out of the German factories, signs are not wanting that the quality of the Hun pilots as a whole is fast deteriorating.

Welcome to a New Recruit

We have to acknowledge the receipt of the first number of the "Journal of the Aeronautical Society of America," dated January 1916, and published, as befits the diffidence of a novice, in modest garb. Essentially, it forms a record of the proceedings of the society, due to a generous bequest by its former president, the late Lee Spear Burridge. The issue is mainly devoted to an article emphasising the unpreparedness of the United States against attack from the air. The characteristic headlines prefacing this article sufficiently indicate the scope of the arguments therein advanced. "Monster guns alone may prove a weakness [a reference to the proposal to instal 16-inch guns at the entrance to Long Island Sound]—1,000 enemy monster battleplanes can drop in one night 9,000 tons of explosives on one Long Island fort—20,000 of these planes will be in the offensive—And two days ahead of enemy transports—What will be left of these forts?—Anti-aircraft guns so far ineffective—Our defence demands at least 10,000 battleplanes—Entire cost of system of aerial defences \$400,000,000—A large sum to pay for the defences of the country—Is not the country worth it?" We give it up. In the words of Mr. Tennant's recent Parliamentary utterance, "God knows!"

J. H. L.

REPORTS ON WIND TUNNEL EXPERIMENTS IN AERODYNAMICS*

I.—THE WIND TUNNEL OF THE MASSACHUSETTS INSTITUTE OF TECHNOLOGY

By J. C. HUNSAKER, Assistant Naval Constructor, U.S. Navy Instructor in Aeronautics,
Massachusetts Institute of Technology

AN aeroplane or airship in flight has six degrees of freedom, three of translation, and three of rotation, and any study of its behaviour must be based on the determination of three forces—vertical, transverse, and longitudinal—as well as couples about the three axes in space. Full scale experiments to investigate the aerodynamical characteristics of a proposed design naturally become mechanically difficult to arrange. The experimental work is much

ducted by the two methods may be ascribed on the one hand to the effect of the moving carriage on the flow of air about the model and to the effect of gusty air, and on the other hand to unsteadiness of flow in some wind tunnels.

The wind tunnel method requires primarily a current of air which is steady in velocity both in time and across a section of the tunnel. The production of a steady flow of

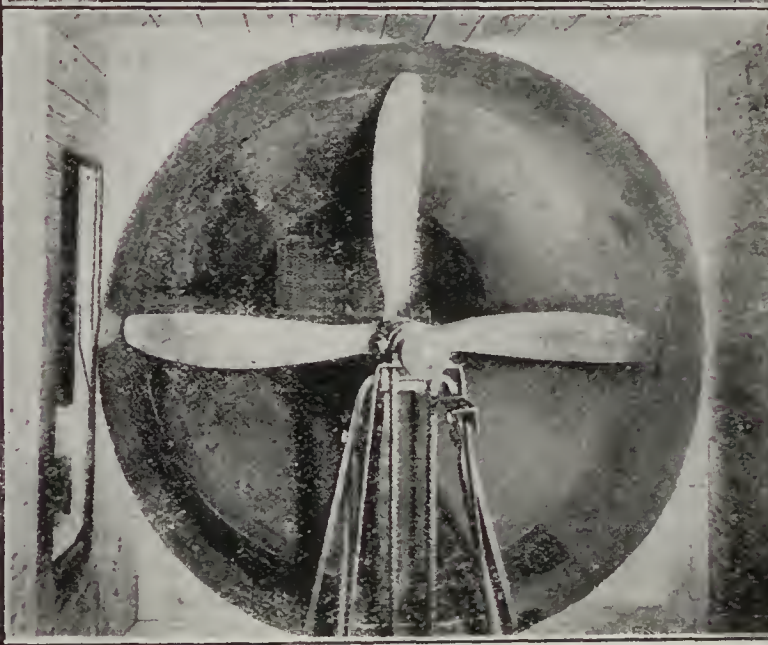
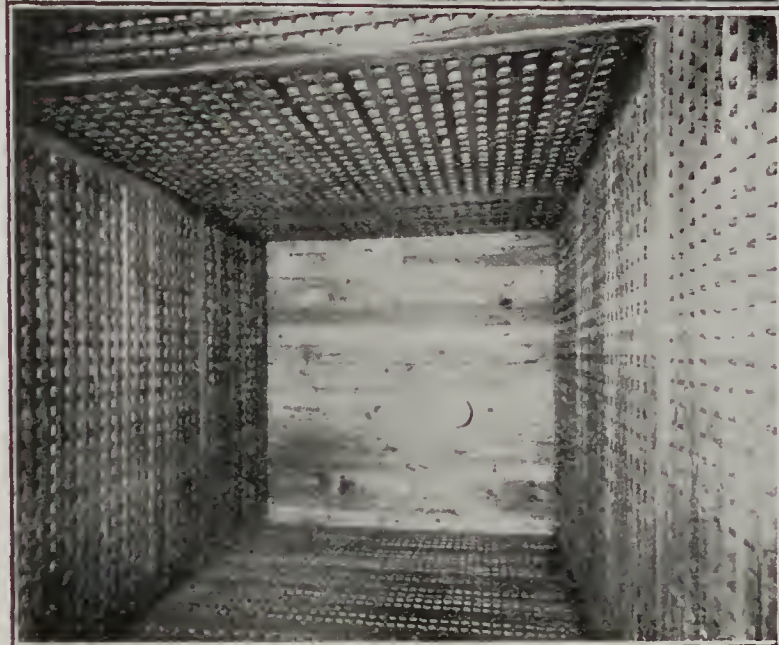
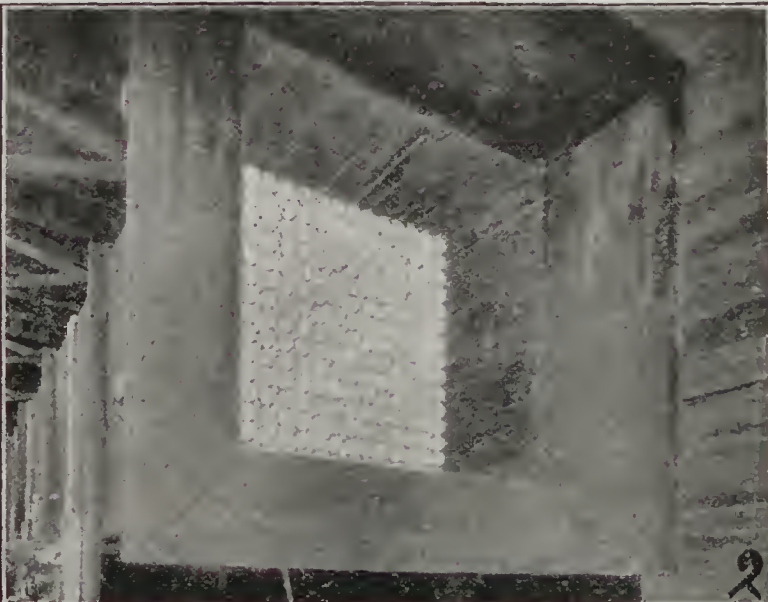
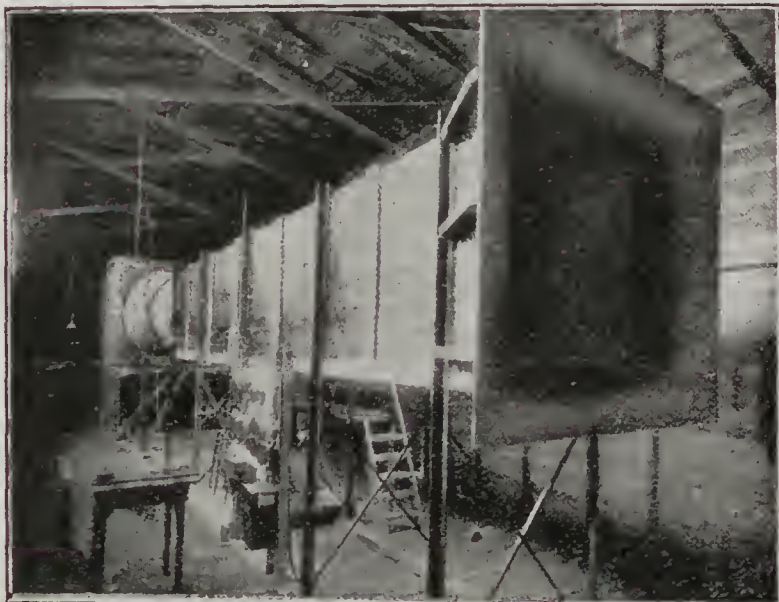


Fig. 1 SUCTION END OF WIND TUNNEL

Fig. 3 INTERIOR OF DIFFUSOR, LOOKING FROM
PROPELLER

Fig. 2. ENTRANCE NOZZLE, SHOWING END OF HONEYCOMB

Fig. 4. PROPELLER OF WIND TUNNEL, LOOKING UP
STREAM

simplified if tests be made on small models as in naval architecture, and a further simplification is made by holding the model stationary in an artificial current of air instead of towing the model at high speed through still air to simulate actual flying conditions.

The use of a wind tunnel depends on the assumption that it is immaterial whether the model be moved through still air or held stationary in a current of air of the same velocity. The principle of relative velocity is fundamental, and the experimental discrepancies between the results of tests con-

air at high velocity is a delicate problem, and can only be obtained by a long process of experimentation. A study was made of the principal aerodynamical laboratories of Europe from which these conclusions were reached: (1) That the wind tunnel method permits a leisurely study of the forces and couples produced by the wind on a model; (2) that the staff of the National Physical Laboratory, Teddington, England, have developed a wind tunnel of remarkable

* From the "Smithsonian Miscellaneous Collections," Vol. 62, No. 4.

steadiness of flow and an aerodynamical balance well adapted to measure with precision the forces and couples on a model in any position; and (3) that the results of model tests made at the above laboratory are applicable to full scale aircraft.

Consequently, it was decided to reproduce in Boston the 4-ft. wind tunnel of the National Physical Laboratory, together with the aerodynamical balance and instruments for velocity measurement. Dr. R. T. Glazebrook, F.R.S., director of the National Physical Laboratory, most generously presented us with detail plans of the complete installation, including the patterns from which the aerodynamical balance was made. Due to this encouragement and assistance we have been able to set up an aerodynamical laboratory with confidence in obtaining a steady flow of air of known velocity. The time saved us by Dr. Glazebrook, which must have been spent in original development, is difficult to estimate.

The staff of the National Physical Laboratory have developed several forms of wind tunnel in the past few years. In 1912-13 Mr. Bairstow and his assistants conducted an elaborate investigation into the steadiness of wind channels as affected by the design, both of the channel and the building by which it is enclosed.* The conclusions reached may be summarised as follows:

- (1) The suction side of a fan is fairly free from turbulence.
- (2) A fan made by a low pitch four-bladed propeller gives a steadier flow than the ordinary propeller fan used in ventilation, and a much steadier flow than fans of the Sirocco or centrifugal type.†
- (3) A wind tunnel should be completely housed to avoid effect of outside wind gusts.
- (4) Air from the propeller should be discharged into a large perforated box or diffuser to damp out the turbulent wake and return the air at low velocity to the room.
- (5) The room through which air is returned from the diffuser to the suction end of the tunnel should be at least 20 times the sectional area of the tunnel.
- (6) The room should be clear of large objects.

The wind tunnel of the Institute of Technology was built in accordance with the English plans, with the exception of several changes of an engineering nature introduced with a view to a more economical use of power and an increase of the maximum wind speed from 34 to 40 miles per hour.

Upon completion of the tunnel an investigation of the steadiness of flow and the precision of measurements was made in which it appeared that the equipment had lost none of its excellence in its reproduction in the United States.

As will be shown below, the current is steady, both in time and across a cross-section within about 1 per cent. in velocity. Measurements of velocity by means of the calibrated Pitot tube presented by the National Physical Laboratory are precise to $\frac{1}{2}$ of 1 per cent. Force and couple measurements on the balance are precise to $\frac{1}{2}$ of 1 per cent. for ordinary magnitudes. Calculated co-efficients which involve several measurements of force, moment, velocity, angle, area, and distance, as well as one or more assumptions, can be considered as precise to within 2 per cent. It is believed that it is not practicable to increase the precision of the observations to such an extent that the possible cumulative error shall be materially less than the above.

DESCRIPTION OF WIND TUNNEL

A shed 20 by 25 by 66 ft. houses the wind tunnel proper, 16 sq. ft. in section, and some 53 ft. in length (Fig. 1). Air is drawn through an entrance nozzle and through the square tunnel by a four-bladed propeller, driven by a 10 h.p. motor. Models under test are mounted in the centre of the square trunk on the vertical arm of the balance to be described later.

* Technical Report of the Advisory Committee for Aeronautics, London, 1912-13. Report No. 67.

† It is of interest to note that Mr. Eiffel has used a helicoidal blower in his new wind tunnel.

The air entering the mouth passes through a honeycomb made up of a nest of 3-in. metal conduit pipes 2 ft. 6 in. in length. This honeycomb has an important effect in straightening the flow and preventing swirl.

Passing through the square trunk and past the model the air is drawn past a star-shaped longitudinal baffle into an expanding cone. In this the plans of the National Physical Laboratory were departed from by expanding in a length of 11 ft. to a cylinder of 7 ft. diameter. This cone expands to 6 ft. in the English tunnel. M. Eiffel affirms that the working of a fan is much improved by expanding the suction pipe in such a manner as to reduce the velocity and so raise the static pressure of the air. Since the fan must discharge into the room, the pressure difference that the fan must maintain is thus reduced. Also with a larger fan the velocity of discharge is reduced and the turbulence of the wake kept down.

The propeller works in a sheet metal cylinder 7 ft. in diameter, and discharges into the large perforated diffuser. The panels of the latter are gratings and may be interchanged fore and aft. The gratings are made of $1\frac{1}{2}$ -in. stock with holes $1\frac{1}{2}$ by $1\frac{1}{2}$ in. Each hole is then a square nozzle one diameter long. The end of the diffuser is formed by a blank wall. The race from the propeller is stopped by this wall and the air forced out through the holes of the diffuser. Its velocity is then turned through 90 degs. The area of the diffuser holes is several times the sectional area of the tunnel, and the holes are so distributed that the outflow of air is fairly uniform and of low velocity (Fig. 3).

A four-bladed black walnut propeller (Fig. 4) was designed on the Drzwiecki system and has proved very satisfactory. In order to keep down turbulence a very low pitch with broad blades had to be used. To gain efficiency such blades must be made thin. It then became of considerable difficulty to insure proper strength for 900 r.p.m. as well as freedom from oscillation.

The blade sections were considered as model aeroplane wings and their effect integrated graphically over the blade. The blade was given an angle of incidence of 3 degs. to the relative wind at every point for 600 r.p.m. and 25 miles per hour. The pitch is thus variable radially.

To prevent torsional oscillations the blade sections were arranged so that the centres of pressure all lie on a straight line, drawn radially on the face of the blade. This artifice seems to have prevented the howling at high speeds commonly found with thin blades. The propeller has a clearance of $\frac{1}{2}$ in. in the metal cylinder.

The propeller is driven by a "silent" chain from a 10 h.p. interpole motor beneath it. The propeller and motor are mounted on a bracket fixed to a concrete block and are independent of the alignment of the tunnel. Vibration of the motor and propeller cannot be transmitted to the tunnel as there is no connection.

The English plans for power contemplate a steady, direct current voltage. Such is not available here. A 15 h.p. induction motor is connected to the mains of the Cambridge Electric Light Company. This motor then turns at a speed proportional to the frequency of the supply current for a given load. Fluctuations of voltage are without sensible effect, and the frequency may be taken as practically constant.

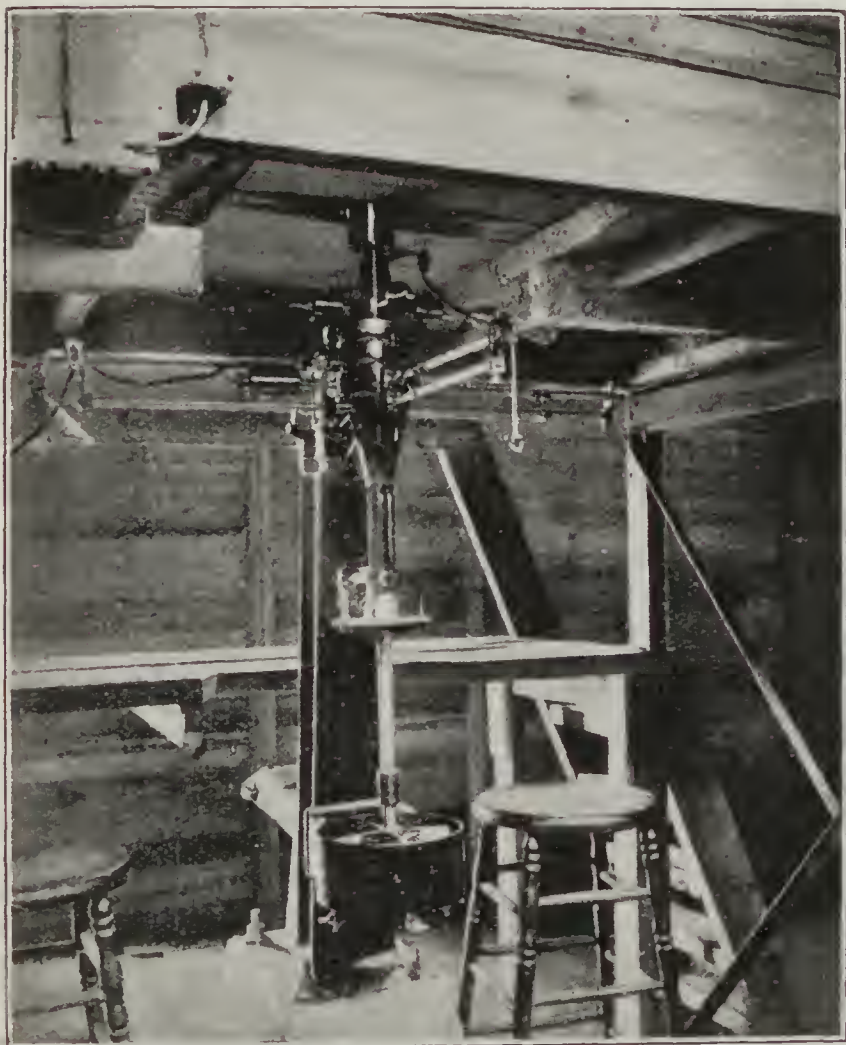
The induction motor is directly connected to a 12 h.p. direct current generator, which is turned at constant speed, and which generates, therefore, a constant direct current voltage for given load.

By change of the generator field rheostat and motor field rheostat the propeller speed can be regulated to hold any wind velocity from 4 to 40 miles per hour. The control is very sensitive. Left to itself, the speed of the wind in the tunnel will vary by 2 per cent. in two or three minutes. This variation is so slow that by manipulation of the rheostats the flow can be kept constant within $\frac{1}{2}$ per cent. The

cause of the surging of the air is not understood, but is probably due to hunting of the governor of the prime mover in the Cambridge power house causing changes in frequency too small to be apparent. The gustiness of outdoor winds seems to have no effect, although the building is not air-tight.

AERODYNAMICAL BALANCE

The aerodynamical balance (Fig. 5) was constructed by the



AERODYNAMICAL BALANCE. Fig. 5

Cambridge Scientific Instrument Co., England, to the plans and patterns of the National Physical Laboratory. The balance is described in detail by Mr. L. Bairstow in the Technical Report of the Advisory Committee for Aeronautics, London, 1912-13. For details of operation and the precision of measurements reference may be made to the original article.

In general, the balance consists of three arms mutually at right angles representing the axes of co-ordinates in space, about and along which couples and forces are to be measured. The model is mounted on the upper end of the vertical arm which projects through an oil seal in the bottom of the tunnel.

The entire balance rests on a steel point, bearing in a steel cone. The point is supported on a cast-iron standard secured to a concrete pillar, which, in turn, rests on a large concrete slab. The balance is then quite free from vibration of the floor, building, or tunnel.

The balance is normally free to rock about its pivot in any direction. When wind blows against the model the components of the force exerted are measured by determining what weights must be hung on the two horizontal arms to hold the model in position. Likewise the balance is free to rotate about a vertical axis through the pivot. The moment producing this rotation is balanced by a calibrated wire with graduated torsion head.

Force in the vertical axis is measured by means of a fourth arm. The model for this measurement is mounted on a vertical rod which slides freely on rollers inside the main vertical arm of the balance. The lower end of this rod

rests on one end of a horizontal arm having a knife edge and sliding weight.

For special work on moments the interior vertical rod is replaced by another having a small bell crank device on its head which converts a moment about the centre of the model into a vertical force to be measured as above (Fig. 4).

In this way provision is made for the precise measurement of the three forces and the three couples which the wind may impress on any model held in any unsymmetrical position to the wind.

The balance is fitted with suitable oil dash-pots to damp oscillations, and devices for limiting the degrees of freedom to simplify tests in which only one or two quantities are to be measured. The balance can be adjusted to tilt for 1/10,000 lb. force on the model. In general the precision of measurements is not so good as the sensitivity in the end is limited by the steadiness of the wind and the skill of the observer.

The weights and dimensions of the balance were verified by the National Physical Laboratory, where also the torsion wires were calibrated.

For ordinary forces weighings may be considered correct to 0.5 per cent. Naturally for very small forces, such as the rolling moment caused by a small angle of yaw, the measurements cannot be so precise.

ALIGNMENT OF TUNNEL.

The axis of the wind tunnel was desired to be horizontal from the honeycomb to the baffle plates in front of the propeller. To accomplish this an engineer's level was mounted on a platform, built on the floor of the house, opposite the mouth of the tunnel, and sighted on the intersection of diagonal threads placed at 6-ft. intervals. By this means the distance of the centre line of the tunnel above or below the horizontal line could be estimated to 1/8 in.

The tunnel being low in the centre, it was raised by wedges until the reference marks coincided with the horizontal. This was attained to within 1/8 of 1 in. in 6 ft. of tunnel length. The tunnel may, therefore, be said to have its axis horizontal to within one-tenth degree.

ALIGNMENT OF VERTICAL AXES OF BALANCE

A concrete foundation having been built for the balance, the latter was set in its approximate position. Three wedges were then inserted under the base plate of the balance standard, and the whole balance raised to its proper height. It was now necessary to rectify the vertical axis of the balance.

To bring the axis of the balance more nearly vertical by more sensitive means the following method was employed: The small torsion wire, used in aerodynamical measurements with the balance, was set in place. The lower pivot of the balance was engaged in its bearing, leaving the balance free to rotate about its vertical axis, but constrained from tipping laterally.

The torsion wire was adjusted by means of the micrometer head until the cross-hair on the fixed telescope coincided with that on the mirror attached to the balance proper.

A weight of 0.4 lb. was placed on one balance arm. The micrometer head was again turned until the cross-hairs were coincident. By setting up on the holding-down bolts, the balance axis was adjusted until placing a weight on either of the arms required no further rotation of the torsion head to maintain coincidence of the cross-hairs. In such case the axis of the balance is vertical. The final adjustment admits of a possible error of less than 1/400 inch-lb. on the torsion wire. The angularity of the balance axis remaining uncorrected may be computed as follows:—

Let

F = force hung on arm.

β = angle of balance axis to vertical.

Then, taking moments about the vertical axis

$$F \sin \beta \times 18'' = 0.4 \times \sin \beta \times 18'' = 1/400$$

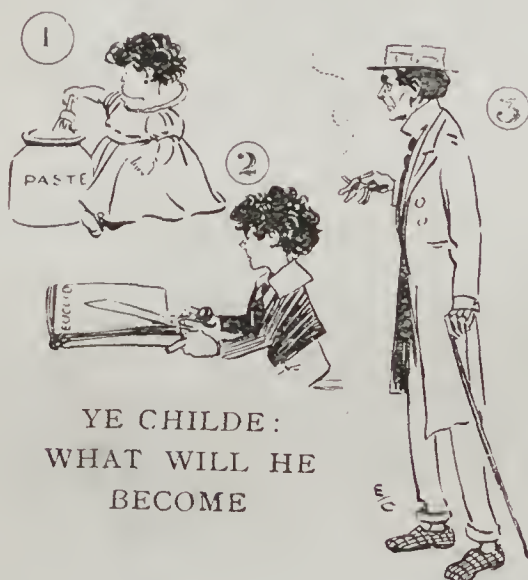
$$\text{or } = 0.0025.$$

(To be continued)

RANDOM REMARKS

XXXIX.—MANNE IN YE MAKYINGE By ARTHUR LAWRENCE

THERE is nothing nobler than man—when he is well dressed. His deficiencies are not then discovered, except as the upshot of some awful catastrophe. The uthier garments of man have a plaintive ugliness which no other manufactured goods can surpass. The strength of the chain lies in its weakest link, and the well-formed person has to wear these things at the request of the bowed and the bandy, of knees that knock and of supports which are not truly Corinthian. I would always wear Court dress myself,



like myself hide behind the fact that so many of that ancient trade flourish on khaki. Let the civilian do his little bit and not make himself a blot on the landscape. The money handed to a tailor will not go out of the country. He will pay his own local tradesmen, and your presence will not be an insult to every human being whom you may be audacious enough to approach. Let everything be done decently and in order. We don't want football shorts for evening wear. The combination of a jersey and tall hat will not do. Let our garb be as sombre as these terrible days shall require, but sandshoes and a Gibus will get no welcome from me.

Of old time the firm of Cassell issued a poster on behalf of their National Educator, entitled "What Will He Become?" The ascension or declension of the bright-looking lad entirely depended upon whether he had been taken in by the National Educator in six-penny parts. I don't know that education has so very much to do with worldly success. I am told that the Rowton Houses and workhouses are replete with men who did terrific things at Oxford and Cambridge. The ideal business man is

he who can hardly sign his own name, or who cannot do so at all until very late in the day. He was flung upon the cold world with half-a-crown, and that he had stolen. There is a far better way. After the boy is a certain age, stop his education (if any) and spend the money in clothes. He will be given the softest sinecures, men of wealth will be quite pleased to know him, his feet shall be under the mahogany of those who dine well. He shall marry the Princess and shall lay his hands on half of the kingdom. My imagination can rise no higher than that, for, in our code, there are no houris in Heaven. At the present moment the best wear is khaki, yet my words of wisdom need not fall on hard ground. Let them stand as a memorial to our children's children.



but it would be stealing a march on the other fellows. Consequently, I have to buy patent presses—and, even so, can make nothing of it. Many questions arise. Should man have a waist? It is now a long time ago that some other fellow named Lawrence wrote some thirty or forty highly popular novels, in the days when novels were new, one of which, "Guy Livingstone," can, I believe, still be obtained. His heroes were mostly Life Guardsmen, six feet wide at the shoulders, with a waist of a wasp. Ouida also would have nothing to write of waistless men. Myself, I think the modern idea is the better way. Let our clothes be made straight and loose, so that no one shall hazard a guess at the contents. We must leave it to the so-called Turkish baths, a fire, or a raid, to expose the Adonis. Let us disguise ourselves as well as our purse will afford.

Long years ago, when J. K. Jerome edited *To-Day*, a paper which sometimes sold itself out at twopence a week, I assisted occasionally in the writing of a weekly column over the pen-name of "The Major." It was the first time that men's dress had been taken seriously, and my then Editor deserved great credit for this and other bright notions. The correspondence still remains in my mind as having been faintly interesting. There was always the man in the country who would want to know why he couldn't wear brown boots with his black frock coat, and the other fellow—a hardy perennial—who protested against our sarcasms at the expense of the man who bought ready-made ties, most fatally, of course, for evening dress. In these *à outrance* days it is the correct thing to dress in the most casual way, but I do enter my protest against folk who propose to go to the extreme of mixing up brown boots and bowlers with some discarded frock coat—a pleasing garment when really well made, but which long ago went dead out of fashion. I don't want to see the tailors extinguished, nor can decrepit old folk

MORE EDITORIAL ECONOMY

PROGRESS OF AMERICAN AVIATION

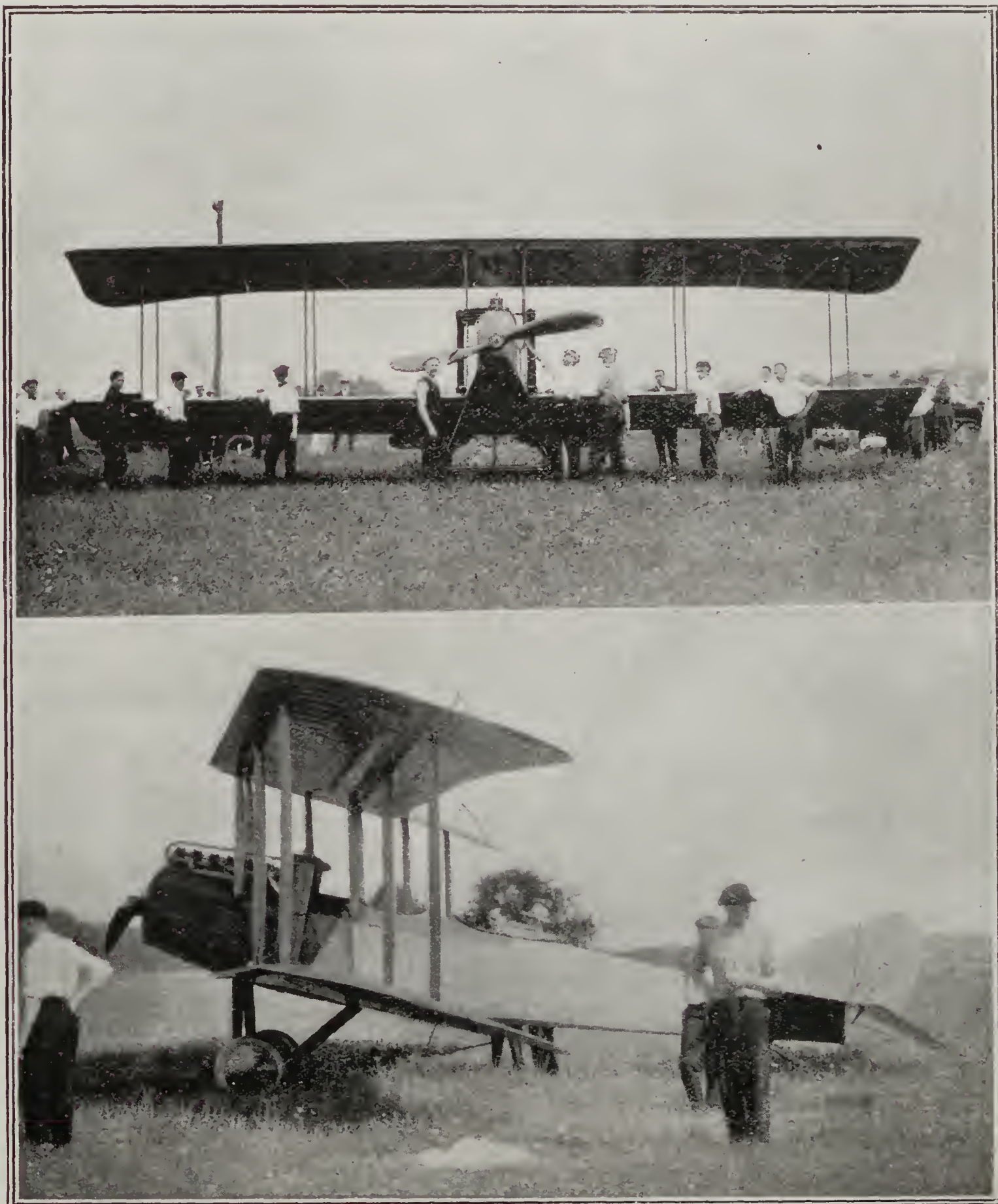
By ERNEST L. JONES, American Editor

SLOANE TRACTOR BIPLANE

OFFICIAL trials have been made of the Sloane tractor biplane, designed by Day, which has been flying in England. In a flight lasting 1 hour and 4 min., climbing speed was found to be 1,000 ft. in 2 min. 15 sec., 2,000 ft. in

sion. The exhaust arrangements have been modified. During the trials the machine carried 40 gallons of petrol and 4 gallons of oil, pilot and passenger of 315 lb.

This model, type "H 1," has been designed and built to meet the requirements arising from the present war for



FRONT AND SIDE VIEWS OF THE SLOANE TRACTOR BIPLANE

4 min. 50 sec., 3,000 ft. in 7 min. 27 sec. The mean speed in three runs up and down was found to be 84.7 m.p.h. The machine was found to handle well in all conditions, with a certain amount of inherent stability. The pilot's view is good, though that of the passenger is rather restricted. The motor ran well at 1,250 r.p.m., and created a good impres-

a reliable and speedy tractor capable of carrying a moderate load for a flight of from four to six hours.

In every respect it is a great advance over anything previously built by the company. The machine has a six-cylinder 125 h.p. Hall-Scott motor. The wing curve is very satisfactory, and has been developed by actual experi-

ence and wind tunnel experiments. The wings are back-swept, and the upper plane is advanced ahead of the lower plane. The whole cell has a slight dihedral angle.

The planes are of standard construction. The ribs are built up of basswood, and then slipped over the spruce beams. The trailing edge is steel. The whole is internally braced with cable and wire. Three steel drift braces are located between the beams at strut points. Beams are reinforced, so that no wing clip bolts pass through them.

The fuselage is rectangular in section—of streamline form—tapering to a vertical pointed section at the rudder post. The longitudinals are ash and spruce, and the up-

Control surfaces consist of vertical rudder and empennage, stabiliser, and two horizontal rudders. Trailing edges and posts of these parts are steel; ribs are set in steel sockets, and the whole thoroughly braced.

The engine is mounted on two ash beams, 2 in. by 5 in., which are hung on two hot-drawn steel plates which reinforce the fuselage as well.

Radiators are vertical tube specially designed for this machine. They are mounted one on each side of the fuselage.

The landing gear is of the two-wheel type. The tubular streamline axle is mounted on two extra-heavy laminated



THE "H 1" SLOANE TRACTOR BIPLANE

rights of the same materials. Back of the pilot's seat solid wire is used for cross bracing, and forward of it cable. Specially designed clamps are used to hold the struts without piercing the longerons. The lower surfaces are attached directly to the fuselage, and the upper planes are supported by short struts mounted on the top of the fuselage.

The whole nose of the fuselage is enclosed by aluminium, and the cockpits are provided with aluminium covers to protect the passengers. The rest of the fuselage is covered with linen, doped and varnished.

U's. Two steel tension and compression members maintain the spacing of these two U's. Four cables stiffen the landing gear, so that side swipes will not affect it. The usual rubber cord shock absorbers are used in the axle. The axle may be removed without disturbing the rubbers. The tyres are 26 in. by 4 in. double tube.

Dimensions.—Spread, 38 ft.; chord, 6 ft. 6 in.; gap, 6 ft. 3 in.; overall, 34 ft.; surface, 510 square feet; horse-power, 125 h.p.; speed, fast 85 m.p.h., slow 47 m.p.h.; climb, 3,000 ft.—7½ min.; load, 900 lb.; weight packed for shipment, 4,300 lb.

BURGESS AND CURTISS COMBINE

THE Curtiss Aeroplane and Motor Company have acquired the services of W. Starling Burgess, of the Burgess Company, Marblehead, Mass., and his organisation.

Under the arrangements for acquiring the services of Mr. Burgess and his organisation, the Curtiss Company will become the owner of the stock of the Burgess Company, but the Burgess Company will continue under its present operating organisation, and will continue to build those types of aeroplanes, especially those of inherently stable design which have created its distinctive demand from the Government and private sources in America and abroad, and will also absorb a large part of the surplus business which the Curtiss Company cannot handle in its own plants.

W. Starling Burgess will at once become a director of the Curtiss Company, and he and his associates will become actively engaged in the business of the Curtiss Company. This addition to the forces of the Curtiss Company is of immense importance to the aeroplane industry.

To-day the Curtiss Company leads the world in the manufacture of aeroplanes of manually controlled design, and is engaged in building aeroplanes on large orders from foreign Governments. With the aid of Mr. Burgess and his organisation the successful conclusion of its present contracts and its prominent position in the aeroplane industry are assured.

There can be no question that the new arrangement will prove beneficial not only to the companies involved, but to the entire aeroplane industry in the country. Not only land machines, but hydro-aeroplanes and flying boats of either the manually controlled type made famous by the Curtiss Company or the Burgess-Dunne self-balancing design can be produced in any quantity which the state of the market demands.

But the greatest importance of the announcement lies in its bearing on national defence. America will henceforth have, for the rapid development of its aerial forces in time of need, the efficient organisation of the greatest corporation in the world now manufacturing aeroplanes. The capacity of the two plants, as already stated, totals ten machines per day, and this rate under war pressure could be increased to nearly double that figure.

At the present time the coasts of this country are virtually without aerial protection against attack by an overseas foe. As a partial remedy for this the Burgess Company plans to organise at Marblehead a North Atlantic station for coast defence, with a large number of machines available for call. Similar provision is under way by the Curtiss Company at Newport News for the South Atlantic section, while the Great Lakes region will be protected through the Curtiss Company at Buffalo. At San Diego there is planned a base for coast patrol of the Pacific coast. The importance of the establishment of these stations for national protection cannot be overestimated.

To-day it is the foreign business which has made possible the development of a strong aeroplane industry in the United States. Both the Burgess and the Curtiss Companies have filled very large foreign orders, and the prospects for the immediate future are bright. Russia, particularly, is in a position where she will take aeroplanes, provided they are suitable, in almost any quantity. It has been her lack of flying craft which has largely contributed to the serious reverses suffered by the Czar's forces in the field.

With no aeroplane industry of her own, and with her Allies straining every nerve to supply their own needs in the aircraft line, Russia is forced to turn abroad for her supply, and the United States alone can fill the demand.

The Burgess Company, at the present time, has under construction (or just completed) thirteen aeroplanes for the United States Government, in addition to a number of machines for use of the National Guard or Naval Militia of the various States. There are also several craft under way for the use of sportsmen, a field in which the Burgess

Company has taken prominent rank. Burgess machines have already been supplied to Mr. Vincent Astor, Mr. Harry Payne Whitney, Mr. Norman Cabot, and other sportsmen.

W. Starling Burgess, the directing head of the Burgess Company, is one of the pioneers in American aviation. Nearly a decade ago he turned his attention to aeroplanes. He associated with himself Greely S. Curtis, of Boston, who brought to the work the technical training of an expert engineer.

Mr. Burgess was awarded the Collier Trophy for 1915. This trophy is awarded annually by the Aero Club of America for the most important advance during the year in aviation.

The business end of the company has been under the charge of Frank H. Russell, previously general manager of the Wright Company at Dayton.

Since its formation the Burgess Company has had a steady growth, and Burgess planes are known the country over for their beauty of design and workmanship. Where the work was easily taken care of in one building by half a dozen men in 1910, now more than a dozen structures and 200 men are kept busy.

From its inception one of the aims of the company has been the production of the safest possible aeroplanes, and as a most important step in carrying out this aim Mr. Burgess in 1913, after a trip to England, secured the sole American rights for the Dunne type.

WRIGHT GETS MOTOR ORDER

FROM an authoritative source it is learned that the Wright Company has an order for 250 engines to be built to French specifications. These will be produced in the plant of the Simplex Car, which is owned by the reorganised Wright Company. The Electrical Boat Company is putting through a new aeronautical engine. This company is headed by Henry R. Sutphen, also a director of the Wright Company. A recent test of the six-cylinder Wright motor at the Simplex plant showed 85 horse-power on a dynamometer at a fair speed.

U.S. NAVAL AERO STATION

During the week ending February 5 scouting flights at Pensacola were made by Lieutenant (J.G.) E. W. Spencer, U.S.N., and Lieutenant R. C. Saufley, U.S.N. Lieutenant Spencer carried Lieutenant Ramsay as an observer, while Lieutenant Evans acted as observer during the flight of Lieutenant Saufley. Lieutenant Spencer's flight was of an hour and twenty minutes' duration, and was made in a fog so heavy that the sea became invisible at an altitude of 600 feet. Lieutenant Saufley's flight lasted one hour and eight minutes. While weather conditions were not as favourable as could be desired, sixty-three hours and fifty minutes of flight, an equivalent to 3,554 miles of flight, was accomplished. Speed trials of a new rescue boat recently received at the station were held and a speed of 37.5 miles an hour obtained. As the engines were not functioning properly during the test it is believed that this boat will be able to do even better.

THE MACKAY TROPHY—The proceedings of the board of officers that awarded the Mackay Trophy this year have been approved by the Department. The Board awarded the trophy for 1915 to First Lieutenant Byron Q. Jones, Signal Corps, for the best record and performance during the year 1915.

N. J. NAVAL RESERVE—The Aircraft Co. has offered to teach two officers and two enlisted men of the N. J. Naval Reserve or National Guard, free of charge, on Sloane tractor biplanes.

U.S. EXPORTS OF AIRCRAFT

DOMESTIC EXPORTS				
	Aero- planes	Dollars	Parts Dollars	Total Dollars
December, 1915 ...	13	156,347	1,331,987	1,488,334
Twelve months ending				
December, 1915 ...	398	2,960,814	2,457,782	5,418,596
DURING DECEMBER SHIPMENTS WERE AS FOLLOWS—				
	Aeroplanes	Dollars	Parts of Aeroplanes Dollars	
England ...	...	—	—	—
France ...	...	—	—	1,460
Canada ...	...	—	—	12,754
Mexico ...	...	—	—	450
Jamaica ...	...	875	—	—
Venezuela ...	...	—	—	740
New Zealand ...	...	—	—	14,520
	13	156,347	1,331,987	

AIRCRAFT IN ACTION

OFFICIAL INFORMATION

ENGLAND

February 29—Two German Machines Brought Down—This morning a German aeroplane, Albatros type, was brought down south of Merville, behind our lines. Another hostile aeroplane turned completely over, burst into flames, and fell behind the German lines in the vicinity of La Bassée. This afternoon a German captive balloon broke loose and drifted northwards at a great height, passing over our lines east of Béthune.

February 29—Enemy Machine Shot Down—Admiralty announcement: "Flight Sub-Lieutenant Simms, R.N.A.S., to-day attacked and shot down a hostile aeroplane, which fell in flames a short distance in front of the Belgian lines, the combat and result being in full view of the Belgian soldiers in the trenches."

March 1—Seaplane Attack on S.E. Coast—War Office statement: "A German seaplane passed over a portion of the South-East Coast of England between 6.15 p.m. and 6.25 p.m. this evening (March 1) and dropped several bombs. No military damage was done. A child of nine months old is reported to have been killed."

March 1—Aerial Activity on Western Front—Yesterday (February 29) there were 20 encounters in the air on our front. The enemy losses were reported yesterday. One of our machines failed to return from a reconnaissance.

March 3—Fate of German Seaplane—Admiralty Announcement: "The French authorities at Dunkirk report that a German seaplane was picked up at 10 a.m. yesterday (March 2) three miles north of Middelkerke Bank. It had come down at 9 p.m. on Wednesday (March 1) when returning from England. One of the observers was drowned and the other picked up and made prisoner."

This is, no doubt, the seaplane which, passed over a portion of the south-east coast of England on Wednesday night (March 1) between 6.15 and 6.25 and dropped several bombs. No damage of any importance was done.

March 6—Zeppelin Raid on N.E. Coast—War Office announcement: "A Zeppelin raid took place last night (March 5), when two hostile airships crossed over the North-East Coast. At the time of this report their movements have not been clearly defined. Some bombs were dropped, which fell in the sea, near the shore, but information is not yet available as to whether any damage has been done on land. A further *communiqué* will be issued later."

MESOPOTAMIA

February 28—Aeroplanes' Useful Work—War Office statement: "Useful information was obtained by our aeroplanes. On the 25th inst. two of our aeroplanes flew up from Basra to General Aylmer's force."

BELGIUM

February 29—German Balloons Adrift—During the afternoon two German balloons of the Drachen type broke from their moorings on our front, and one of them fell in the sea off La Panne and the other near Coudekerque. The aeronauts were made prisoners.

FRANCE

March 1—German Aeroplane in Flames—One of our aircraft crews, in a double-engined aeroplane, defeated an enemy aeroplane, which fell at La Bassée into the German trenches and caught fire as it struck the ground.

March 2—Raid on Chambley and Bendorf—In Champagne a German aeroplane, cannonaded by our batteries near Suippes, fell in flames in the enemy lines.

Last night (March 1) one of our bombarding air squadrons dropped 44 bombs of all calibres on the station of Chambley, which appears to have sustained great damage. Notwithstanding a lively cannonade, our aeroplanes returned to our lines unharmed. During the day our aeroplanes also threw 40 bombs on the station of Bendorf, and nine projectiles on the enemy establishments of Avricourt.

[Vigneulles and Chambley are on the line from St. Mihiel which joins the Metz-Nancy railway at Arnaville. Avricourt and Bendorf are both in Lorraine. Avricourt north-east of Lunéville].

March 3—German Biplane Brought Down—Adjutant Navarre yesterday (March 2) in the region of Douaumont, brought down a sixth German aeroplane of the Albatros type, which fell in our lines. The occupants, who were wounded, were taken prisoners.

March 5—Bombs on Conflans Station—One of our aeroplanes last night (March 4) dropped several bombs on the railway station of Conflans, where great activity prevailed.

[Conflans is the most important junction on the railway system between Metz and Verdun. It lies 23 miles due east of the latter.]

RUSSIA

March 1—Bombs in Dvinsk Region—Enemy aeroplanes dropped bombs and used machine-gun fire north-west of Friedrichstadt (on the Dvina) and against Dvinsk.

March 2—German Aerial Activity—Numerous German aeroplanes threw bombs above the Riga sector, and bombs were also dropped from aeroplanes between Uexküll (south-east of Riga) and Elisenhof, on the Dvina.

GERMANY

March 1—Aerial Exploits—In an aerial fight near Menin we forced a British biplane to descend, and it was captured with its occupants.

Two French biplanes were shot down by rifle fire—one near Veza-ponin, north-west of Soissons, its occupants being captured, and the second to the south-west of Soissons. Its occupants are apparently dead. An aeroplane piloted by Reserve Lieutenant Kuehl, with Reserve Lieutenant Haber as observer, brought to a standstill, by bombing a military transport train on the line between Besançon and Jussey, and successfully attacked with their machine-gun a military convoy train.

[From a French source we learn that the second French machine which the Germans claim to have brought down south-west of Soissons simply planed safely down toward the French lines and that neither occupants was in any way injured.—Ed].

March 2—Russian Aeroplane Brought Down—North-west of Mitau (near Riga) a Russian aeroplane was brought down, and we captured its occupants. Our aviators successfully attacked the railway works at Molodechno.

March 3—British Aeroplane Brought Down—Lieutenant Immielmann shot down east of Douai his ninth enemy aeroplane, a British biplane with two officers, of whom one was killed and the other seriously wounded.

March 3—Verdun Fortress Bombarded—Our aviators bombarded successfully the French troops in the fortress region of Verdun.

FROM OTHER SOURCES

ENGLAND

March 1—Attack on S.E. Coast—A Correspondent of the *Morning Post* stated: "That at eighteen minutes past six a hostile aeroplane, flying very high, dropped six bombs. A few houses were slightly damaged, and a large number of windows were broken. The aeroplane afterwards disappeared."

March 1—Air Raid on Warships—It is reported from the Belgo-Dutch frontier that British warships which yesterday afternoon (February 29) bombarded the coast were raided by an air squadron, probably the same squadron which was sighted yesterday off the coast of Zeeland.

March 2—Child's Death During Air Raid—During the air raid on the South-East Coast on March 1 one bomb was dropped on the back of a dwelling-house, destroying the roof and some of the brickwork. A lady who was in the nursery with a baby snatched up the child from the floor, and in her excitement dropped it. The infant suffered injuries to the head which proved fatal almost immediately.

FRANCE

February 27—Bombing Smyrna Forts—The recent French air attack against the Smyrna positions caused the greatest terror in the city, crowds rushing out into the streets. But the aircraft only threw down leaflets saying, "We are fighting the Turkish Government, not the people." Hits were scored by the raiders on the Turkish forts at the Twin Brothers heights (north-west of Smyrna) and elsewhere. The grand stand at the racecourse where the Turks had an aerodrome was completely destroyed. The whole water front at Vurla, west of Smyrna, was wrecked. Daily coast bombardments are now taking place at Smyrna and the neighbourhood.

February 29—Bombs on Chalons—According to a provincial report, a German machine dropped a few bombs on Chalons.

March 1—Bombs on Reims—According to a provincial report, during the heavy bombardment of Reims which began on February 28, a German machine dropped some bombs on the town.

March 2—Destroyers of LZ77 Decorated—President Poincaré left Paris on Tuesday (February 29) evening to visit the Verdun front. He stopped at Révigny, where he congratulated the crew of the gun which brought down the Zeppelin, decorating the happy gunner with the *Médaille Militaire* and conferring the *Croix de Guerre* upon the other members of the section.

March 2—Verdun Unfavourable for Aerial Reconnaissance—A semi-official review of the fighting before Verdun says: "All evidence shows that the Verdun region was chosen by the Emperor's General Staff because the wooded region around Verdun was not very favourable for aerial reconnaissance. Nevertheless, we were not unaware of these preparations, although possibly we did not realise their great importance."

BALKANS

March 3—French Air Raid on Smyrna—It is reported from Salonika that last week seven French aeroplanes left there for Smyrna, where they bombarded the batteries and encampments. They returned to Salonika after an absence of twenty-four hours, having travelled six hundred kilometres.

March 3—New French Aerodrome—Materials have been landed for the installation on a large scale of a new French aerodrome near the mouth of the Struma. The work is already well in hand.

March 5—Airship Driven off Salonica—According to an Athens telegram, on the previous morning a Zeppelin was reported making towards Salonica. The Allies' batteries forced it to turn back.

NORWAY

March 1—Attack on Norwegian Steamer—The newspaper *Norges Handels og Sjaefartstidende* states that the steamer *Modemi*, of Christiania, on its way to England, was bombarded by aircraft, without, however, sustaining any damage. Several bombs were thrown. The aeroplane then flew west. The *Modemi* was flying the Norwegian flag, and the Norwegian colours were painted on the hull.

SWEDEN

February 19—Zeppelin off Swedish Coast—A telegram from Malmö states that a Zeppelin was sighted there late last night (February 18), coming from the south-west and travelling in a north-west direction. The airship was easily distinguishable, and is said to have been of considerable size. The noise of its engines could be heard quite distinctly.

According to the *Köbenhavn*, a German airship cruises each day along the Falsterbo reef, where a new German minefield is to be placed. On Friday night (February 18) it lost its way owing to fog and passed over Malmö harbour.

February 25—Zeppelins off Sweden—The Gothenburg correspondent of the *Stockholm Tidningen* telegraphs that on Wednesday last (February 23) three Zeppelins were sighted off the Vinga light, travelling westwards, and that last night (February 24) another airship was observed there proceeding to the south-west.

February 14—"L 20" Reported Damaged—The *Ribe Stiftstidende* states that off Blaavand, in Jutland, a Zeppelin, the "L 20," was observed flying very low, and going in a south-easterly direction. The people could easily see her, and noticed that she was under the average height. Later on she went in a south-eastern direction and disappeared.

("L 20" was reported as being in difficulties in our issue of February 16)

February 14—Germany's Apology—The German Government has expressed its regret to the Danish Government for the fact that a German airship on January 31 passed over Danish territory for a short distance near Vedsted. The German Government explains that the violation of neutral territory was due to the airship having mistaken its whereabouts as the result of foggy weather.

(Reported in our issue of February 16)

February 21—Germany Building Zeppelin Sheds—Travellers coming from Germany report an extraordinary activity in the building of Zeppelin sheds.

February 21—Zeppelin Wrecked—According to a report from Schaffhausen, one Zeppelin was wrecked in last Tuesday's (February 15) storm at Friedrichshafen and another damaged.

February 22—Apology to Denmark—Germany has formally apologised to Denmark for the violation of territory by Zeppelin L 7 in passing over the frontier at Vedsted on January 31.

February 24—Death of Major Sperling—Major Sperling, former commander of the entire German Army Air Fleet, has just died in a sanatorium near Berlin. Sperling piloted the first Army Zeppelin from Friedrichshafen to Metz in 1909, its safe arrival being the occasion of celebration throughout the country.

February 24—Two Zeppelins a Week—The *Kölnische Volkszeitung* states in a communication from Friedrichshafen that the new Zeppelin factories have been considerably enlarged and are making two Zeppelins weekly of a new type, built to carry six machine-guns and two small cannon, with special apparatus for throwing bombs and air torpedoes. The gondolas are steel plated. Trials have been made by the Zeppelins to throw asphyxiating gas around the airship to ensure flight when pursued. The last Zeppelin built bore the number 95.

February 25—Germany's Hero—The *Foehrszeitung* says that the hero of the hour is a native of the island of Foehr, West Schleswig. He is the naval airman Friedrich Christiansen, of Wyk, "whose deathless deed in bombing Ramsgate recently, in the company of another seaplane, astonished the whole of England." Christiansen has been promoted "Vize-Steurmann," and has received the inevitable Iron Cross.

STRINGENT WEEDING OUT OF GERMAN AVIATORS

The Field Staff, according to the *Russko-Slovo*, has received details as to the extraordinary efforts Germany and Austria are making to extend and improve their aviation services. Germany's aviation colleges during the progress of the war have been increased three times in number. Without exception every aeroplane or airship building establishment has now its own school. In all the schools the chief instructors are aviators and mechanics direct from the front, who teach for a short time and then return for new experiences. In this way the link between schools and flying detachments at the front is maintained. Every newly found experience at the front is at once reported to the chief colleges. Its merit and general applicability is tested both in theory and practice, and if the result is favourable, the method is recommended to all fronts. The number of aviation pupils has lately decreased. At first practically all aspirants to aviation, military or civilian, were accepted. The colleges were overcrowded. Pupils taken as healthy proved after partial training to be unable to withstand atmospheric conditions at high altitudes. Others were technically deficient, and some proved unfit to apply their aviation teaching to war.

The number of accidents were enormous. Most teaching machines were put out of order or destroyed early in the war. Last summer there was a thorough examination and overhauling of all schools, and hundreds were dismissed, only first-rate men being kept. The rules of admission were made more stringent, and one qualification was a good technical and military grounding. A large proportion of pupils are officers who first qualified as observers, aeroplane machine-gun workers, or bomb-throwers.

In Austria the aviation colleges are relatively few, but are being increased. In many the chief instructors are Germans.

Austria, in exchange, is Germany's benzine provider. Last autumn Germany began to suffer badly from lack of benzine. In order to save benzine special "training aeroplanes" were constructed in which all the preliminary teaching work was done on the ground.

Vast preparations, it is said, are being made for air raids on England and France in the spring.

AIR RAID FICTION

The Wolff Bureau circulated to the German Press on February 24 the following message about the Zeppelin raid on the Midlands. It is perhaps the choicest example of German official mendacity which the war has yet produced, and it will doubtless be appreciated especially in the districts which the Germans think, or profess to think, they visited:—

"From authoritative quarters we learn the following facts about the results of the air attack on the night of January 31:

1.—LIVERPOOL

"The main objects of the attack were the docks and the port and factory areas. The effect of the bombs was good; during the return voyage of the airships an enormous fire was still visible at a great distance. A number of bridges and harbour areas were so severely damaged that it is for the present no longer possible to use them. It is said that a number of ships in the Mersey were badly damaged—among others a cruiser lying below Birkenhead and a transport ship of the Leyland Line. Stables containing 200 horses were destroyed by fire, and it is said that the horses and the Canadian troops guarding them were killed. Great damage was done at Birkenhead, Garston, and Bootle. The Booth Line and Yeoward Line have been severely injured by the partial destruction of their docks. Three ships suffered great injury. The neighbouring dry docks and engine works, as well as the 'Birkenhead Dry Dock, Engine, and Boiler Works,' were completely destroyed. In all more than 200 houses were destroyed by bombs or fire. At the mouth of the Mersey (in Bootle) a powder factory was completely destroyed. At Crewe, south-east of Liverpool, the railways were greatly damaged, so that traffic with London was interrupted. At this point military encampments also are said to have been set on fire.

2.—MANCHESTER

"The objects of attack were mainly foundries, which were sprinkled with bombs with good success. Two foundries and two large ironworks were completely destroyed. A number of other factories suffered considerable damage.

3.—SHEFFIELD

"In the south of the town two foundries were bombed, and one of them was in great part destroyed. Several large industrial areas and the railway were bombed, and it is said that two sheds which served military purposes were destroyed. Large fires were observed for a long time after the attack.

4.—NOTTINGHAM

"Attacks were made on large factory areas and foundries, and very good effects were observed. A battery which had fired without effect upon our airships was reduced to silence. A munition factory and several factory areas were badly damaged. At Grantham, east of Nottingham, the railways were destroyed, so that traffic had to be stopped for several days. By far the greatest amount of damage was done at Sheffield and Nottingham; London insurance societies estimate it at £400,000.

5.—BIRMINGHAM

"Two large Government works and two munition factories were completely destroyed, and a brewery was damaged. Great damage was done generally in Staffordshire, Shropshire, Cheshire, Leicestershire, Lincolnshire, and Yorkshire. At Eccleshill, near Bradford, a munition factory and three spinning works were destroyed, and at Partington 22 houses were destroyed by one bomb.

6.—HUMBER

"A battery which fired without effect upon our airships was attacked and reduced to silence. Guns and searchlights belonging to the battery were destroyed. Bombs were thrown upon a number of industrial areas on the Humber and on a large foundry, good success being observed everywhere. At Grimsby the shipbuilding yards and warehouses, as well as several cargo and fishing vessels, were severely damaged. A hay and straw warehouse was burned down, considerable damage being thus done. Between Hedon and Salt End (below Hull) a powder magazine was destroyed. Near Hull a smelting works was badly damaged. In Hull itself the devastation is said to have been very great, and to have almost equalled that in Sheffield and Nottingham. A block of houses in King Street was entirely destroyed. The railway and port areas suffered so much that there is great difficulty in carrying on work. Several trading ships lying in the docks are said to have been damaged. Above Goole a foundry was badly damaged. In the Humber the small cruiser *Caroline* and the destroyers *Eden* and *Nith* were sunk. The small cruiser *Caroline* went down in six minutes; 31 men of the crew were killed, 58 wounded, and 47 drowned.

7.—GREAT YARMOUTH

"A factory and various industrial areas were bombed, good effects being observed, and on the English east coast yet another battery was silenced and the English steamer *Franz Fischer* was sunk by one of the airships."

The "report" ends with remarks about the moral effect of the attack, and with the statement that all the public buildings of Liverpool are to be insured for £3,000,000.

STATEMENTS IN PARLIAMENT

HOUSE OF COMMONS

February 29. *Royal Flying Corps*—Mr. Tennant informed Mr. Fell (U., Yarmouth) that there were on the waiting list of the Royal Flying Corps 835 officers and 521 civilians. The establishment is not yet complete.

Anti-Aircraft Corps—Dr. Macnamara, replying to a question by Mr. Rowlands (R., Dartford), states: Sir Percy Scott has written a letter to the First Lord expressing his appreciation of the services rendered by the officers and men of the Anti-Aircraft Corps. Nothing would give us greater pleasure than to cause this communication to be published *in extenso*, but as it contains a record of the steps which have been taken under Sir Percy Scott's direction to improve the gunnery defences of London, it would clearly not be in the public interest to do so. Nevertheless, I am sure the House would like to know that Sir Percy Scott, as a result of the five months' experience during his tenure of the command of the gunnery defences of London, takes occasion to speak in the highest terms of the manner in which the members of the Anti-Aircraft Corps—drawn, as they are, from all professions and spheres—have devoted themselves to their duties. He tells us that they have all—both officers and men—displayed an energetic eagerness to master the intricacies of their duties; and it gives him great pleasure to pay a tribute of appreciation to the valuable services they have rendered. On behalf of the Board of Admiralty, I cordially associate myself with his commendation.

March 2. *The Air Service*—Lord Derby: It is said that I cannot possibly undertake what work I have at the War Office and at the same time undertake the other work connected with the Air Service. If only those who accuse me of that—of trying to do more than one possibly can—would realise my position with regard to the Air Service—which is very different indeed from what they assert—they would know that it is perfectly possible for me to undertake it. I am stated to be responsible for the air defence of the United Kingdom. I have nothing whatever to do with the Air Minister. I am chairman of a committee, and I am pleased to say that I have nothing whatever to do with the defence of the United Kingdom against aerial trouble. I wish to emphasise that, because one of the newspapers said—and it has been repeated by others and also by one distinguished man in Parliament—that what was required was that the Air Service should have at its head for the defence of this kingdom against aircraft a man who, if anything went wrong, should be hanged. My sense of preservation makes me emphasise the fact that I have nothing whatever to do with the defence of this country against aircraft.

AIR DEFENCES OF LONDON

In a written answer to Mr. Chancellor, Mr. Tennant states that the military *personnel* added to the anti-aircraft defences are not in place of, but in addition to, the former naval *personnel*. Some redistribution has taken place, the naval *personnel* having been replaced at certain points by soldiers and transferred to other points. The military *personnel* working the anti-aircraft guns for the defence of London are specially qualified by training.

PROGRESS AT THE FLYING SCHOOLS

The London and Provincial School—Instructors: W. T. Warren, M. G. Smiles, C. M. Jacques, H. Sykes, and W. T. Warren, jun. Pupils doing rolling: Archer, Hay, Dawson, Houba, and Aldous. Pupils doing straights: Brown, Moore, Scott, and Clement. Pupils doing circuits and eights: G. V. Aimer, E. Lambert, J. Palethorpe, J. Ledure, M. Vertongen, and C. M. Clement. Royal Aero Club Certificates have been obtained this week by G. V. Aimer, E. Lambert, J. Palethorpe, J. Ledure, and M. Vertongen.

The Ruffy-Baumann School—Instructors: Edouard Baumann, Felix Ruffy, Ami Baumann, and Clarence Winchester. Straights or rolling alone: Laidlaw, Cuthbertson, D'Opstael. Eights or circuits alone—D'Opstael, Thomsen. Certificate taken during the week by A. Thomsen, who passed his tests in very good style. Machines: 50 and 60 h.p. Ruffy-Baumann and Caudron type biplanes. Remarks: Although the weather has been far from ideal a good deal of instruction has been accomplished, as well as a certain amount of engineering and constructional work.

The Grahame-White Civilian School—Straights with instructor: Baragar, Box, Hathaway, Eichelbrenner, Hillaby, Holman, Matthews, Sandys, Rigby, Sloden, Smith, Tanner, and Williams. Circuits with instructor: Butler and Leigh. Brevet during week: Verguult. Instructors during week: Biard, Hale, Manton, Pashley, Russell, and Winter.

The Hall School—With A. Chave: Longton, Mahoney, Duncan, Collier, Rand, Le Grice, Warswick, Osmond, Halliday. With C. M. Hill and J. Drew: Robert, Smith (2), Rochford, Neal, Millburn, Chapman, Arnsby, Ormerod, Smith (1), Wooley, Lieutenant Cook, Dodd, Thom, Collins, Taylor, Osmond. Machines in use: Hall Government type tractors.

CASUALTIES

ROYAL NAVAL AIR SERVICE

February 18

SLIGHTLY INJURED

Dover, Probationary Flight Sub-Lieut. Melville G., R.N.

ROYAL FLYING CORPS

February 22

WOUNDED

Henderson, Lieut. M., 4th Seaforth Highlanders (City of Dundee) (T.F.) and R.F.C.

February 23

WOUNDED

Blackman, 15320 Second Class Air Mechanic S. E.
 Campion, 13096 Second Class Air Mechanic C. T.
 Cooper, 16591 Second Class Air Mechanic A.
 Field, 11961 Second Class Air Mechanic W. E.
 Mansbridge, 16929 Second Class Air Mechanic W. P.
 Scruby, 11980 Second Class Air Mechanic H. H.
 Spinks, 18325 Second Class Air Mechanic L. C.

February 24

WOUNDED

Briggs, 3508 First Class Air Mechanic H.

Undated

KILLED

Archer, Second Lieut. A. E. C., East Kent Regt. and R.F.C.
 PREVIOUSLY UNOFFICIALLY REPORTED KILLED, NOW OFFICIALLY REPORTED DIED
 Field, Lieut. C. V. G., 4th Canadian Infantry Bn., attached R.F.C.

February 25

WOUNDED

Barracough, Second Lieut. J. C., Yorkshire Regt. and R.F.C.

UNOFFICIALLY ANNOUNCED

The following notice appeared in the obituary columns:—
 Stileman—Killed in action, February 29, Cecil Herbert Stileman, R.F.C., the dearly-loved elder son of Mr. and Mrs. Herbert I. Stileman, of Derwent House, Wimbledon Park, aged 22 years.

February 27

KILLED

Roshier, Flight Lieut. Harold, R.N.

February 27

PREVIOUSLY MISSING, NOW REPORTED PRISONER OF WAR
 Pearson, Second Lieut. L. J., R.E. and R.F.C.

INQUEST ON FLIGHT-LIEUT. ROSHER

An inquest was held at Dover on February 29 on the body of Flight Lieut. Harold Roshier, aged 22, who was killed while flying at Dover on February 27, and a verdict of "Death from misadventure while testing a machine" was returned.

On Sunday Lieut. Roshier's machine nose-dived down from a height of about 260 ft. The tail of the machine was on top of him, the machine apparently having fallen upside down. Nothing was known as to the cause of the accident.

The funeral took place with naval honours at Dover on March 2. (Lieut. Roshier's death was notified in our issue of March 1.)

APPOINTMENTS

ROYAL NAVAL AIR SERVICE

Squadron Commander:

H. L. Woodcock, promoted to rank of Wing Commander, with acting rank of Commander, R.N., with seniority of February 29.

H. S. Murton (late Sapper, Canadian Engineers), entered as Probationary Flight Sub-Lieut. (temporary), with seniority of February 11, and appointed to *President*, additional, for R.N.A.S.

Flight Commander (Temporary):

John W. K. Allsop to the *President*, additional, for the Air Department, Admiralty: March 3.

To be Temporary Flight Lieut.:

William P. Groves: February 1.

G. B. Hardy, entered as temporary Warrant Officer, Second Grade, and appointed to the *President*, for R.N.A.S., to date March 6.

R. H. Yeates, entered as Probationary Flight Sub-Lieut. (temporary), with seniority of February 9, and appointed to *President*, additional, for R.N.A.S.

Temporary Sub-Lieut. (R.N.V.R.):

G. Whale, to *President*, additional, for R.N.A.S.: March 1.

Air Mechanic, First Grade, J. C. Atkinson, granted the temporary rank of Sub-Lieut. (R.N.V.R.), with seniority of February 29, and appointed to *President*, additional, for R.N.A.S.

Temporary commissions as Lieut. (R.N.V.R.) have been granted to Temporary Warrant Officer (Second Grade) G. D. Nelson, and C. Birch, with seniority respectively of February 29 and March 2, and both appointed to *President*, additional, for R.N.A.S.

ROYAL FLYING CORPS

Central Flying School

Instructor:

Lieut. (Temporary Capt.) Claude G. S. Gould, R.A., a Flight Commander, Military Wing, and to retain his temporary rank whilst so employed, vice Temporary Capt. Hon. W. F. F. Sempill (Master of Sempill), Special Reserve: February 12.

D.A.Q.M.G.:

Capt. (Temporary Maj.) A. Christie, R.A., from a Squadron Commander, R.F.C., and to retain his temporary rank while so employed, vice Maj. G. M. Griffith, R.A.: February 4.

Squadron Commanders, and to be Temporary Maj. while so employed:

Capt. C. Bovill, R.A., from a Staff Officer, R.F.C., and Capt. W. F. MacNeece, Royal West Kent Regt., from a Flight Commander: February 16.

Wing Adjutants:

Lieut. A. McR. Moffat, Princess Louise's (Argyll and Sutherland Highlanders), T.F., a Flying Officer (Observer), and to be Temporary Capt. whilst so employed: February 10.

Maj. Norman D. K. MacEwen, Princess Louise's (Argyll and Sutherland Highlanders), vice Temporary Second Lieut. (Temporary Capt.) J. B. Solomon, Oxfordshire and Buckinghamshire Light Infantry: February 16.

Flight Commander:

Temporary Lieut. G. A. Burney, Scottish Horse Yeomanry, T.F., from a Flying Officer, and to be Temporary Capt. while so employed: January 18.

Flight Commanders, from Flying Officers, and to be temporary Capt. whilst so employed:

Lieut. Robert Egerton, Princess Victoria's (Royal Irish Fusiliers), and Second Lieut. William T. L. Allcock, Special Reserve: February 21.

Flying Officers:

Appointment of Capt. M. G. Lee, 40th Pathans, Indian Army, in *Gazette* of February 4, is cancelled.

Temporary Capt. J. T. Powell-Whittaker, A.S.C., and to be transferred to General List; Temporary Lieut. E. H. Gibbon, R.E., T.F.; Temporary Second Lieut. D. H. Gray, Liverpool Regt., and to be transferred to General List; Temporary Second Lieut. J. E. H. Freeman, Royal West Surrey Regt., and to be transferred to General List; Temporary Second Lieut. R. A. Pierpoint, Royal Berkshire Regt., and to be transferred to General List; Temporary Second Lieut. A. W. Keen, A.S.C., and to be transferred to General List; Second Lieut. S. L. Pettit, Royal Fusiliers, Special Reserve, and to be seconded; Second Lieut. R. J. Bevington, R.A., Special Reserve; Second Lieut. R. P. Sherriff, North Staffordshire Regt., Special Reserve, and to be seconded; Second Lieut. J. C. Simpson, Special Reserve: February 15.

Second Lieut. E. M. L. Ainslie, Duke of Cambridge's Own (Middlesex Regt.), T.F.; Second Lieut. Sturley P. Simpson, Bedfordshire Regt., and to be seconded; Second Lieut. Richard L. Burdon-Sanderson, Special Reserve: February 19.

Temporary Lieut. G. J. Jones, Lancashire Fusiliers, and to be transferred to General List; Temporary Lieut. K. T. Dowding, Royal West Surrey Regt., T.F.; Second Lieut. D. D. G. Hall, Yorkshire Regt., Special Reserve, and to be seconded: February 16.

Capt. M. G. Lee, 40th Pathans, Indian Army; Temporary Lieut. P. G. Marr, Army Cycle Corps, and to be transferred to General List; Second Lieut. R. M. S. Shepherd, Royal Irish Regt., Special Reserve, and to be seconded; Temporary Second Lieut. W. S. Earle, General List; Temporary Second Lieut. W. L. Clark, Middlesex Regt., and to be transferred to General List: February 17.

Flying Officers (Observers):

Capt. G. Henderson, 38th King George's Own Central India Horse, Indian Army; Temporary Capt. W. Milne, General List; Lieut. R. G. H. Murray, 9th Gurkha Rifles, Indian Army; Temporary Lieut. N. C. Sampson, General List; Lieut. G. A. Parker, Northamptonshire Regt., and to be seconded; Lieut. J. V. Steel, R.A., and to be seconded; Lieut. J. G. Selby, R.A., and to be seconded; Lieut. I. Macdonell, Lord Strathcona's Horse (Royal Canadians); Lieut. E. N. Clifton, Coldstream Guards, Special Reserve; Temporary Second Lieut. M. A. J. Orde, General List; Second Lieut. J. E. Evans, Royal Welsh Fusiliers, and to be seconded; Temporary Second Lieut. C. Seedhouse, General List; Second Lieut. J. O. Andrews, Royal Scots, and to be seconded: October 21.

Second Lieut. B. E. Sutton, Westmorland and Cumberland Yeomanry, T.F., and Second Lieut. A. W. F. Glenny, A.S.C., and to be seconded: February 2.

Temporary Lieut. F. J. Roberts, A.S.C., and to be transferred to General List; Second Lieut. H. Welch, R.F.A., T.F.; Second Lieut. N. N. Caton, R.F.A., Special Reserve, Temporary Second Lieut. H. D. W. Wilson, General List: February 12.

Temporary Second Lieut. G. G. Boyton, General List, and Temporary Second Lieut. N. L. Robertson, General List: February 15.

Temporary Second Lieut. A. Duguid, R.A., and to be transferred to General List; Second Lieut. E. W. Stubbs, Liverpool Regt., T.F.; Temporary Second Lieut. G. Price, General List: February 17.

Equipment Officer:

Maj. G. M. Griffith, R.A., from a D.A.Q.M.G.: February 4.

Assistant Equipment Officers:

Second Lieut. G. J. King, West Yorkshire Regt., T.F.: December 6.

Temporary Capt. B. T. Monier-Williams, R.A., and to be transferred to General List; Temporary Capt. E. A. Goodwin, Cheshire Regt., and to be transferred to General List; Temporary Lieut. E. A. Jackson, Yorkshire Light Infantry: February 15.

Temporary Second Lieut. E. J. Howard, Bedfordshire Regt., and to be transferred to General List.

Second Lieuts., Special Reserve:

D. Cushing, Morden M. Mowat, William A. Spratt, G. M. Murray, Hugh H. McL. Fraser, Cecil A. Lewis, Cecil W. Blain, C. P. W. Jolliffe, R. E. H. Daniel, J. D. Troup, H. Phillips, S. A. Alder, T. L. Collins, J. V. Read, E. L. Pegge, R. F. Howard, G. F. Underwood, R. F. Tindall, W. C. Stringer, and F. C. Rowe.

To be Temporary Second Lieuts.:

Sergt. J. Inwood, from 3rd Canadian Mounted Rifles: February 7.

Tpr. Alexander A. Norman Pentland, from 10th Australian Light Horse, and First Class Air Mechanic F. R. Hatch, from R.N.A.S.: February 21.

To be Second Lieuts. for Service in the Field:

First Class Air Mechanic W. J. Cooper, from R.F.C., and First Class Air Mechanic J. W. Burt, from R.F.C.: February 6.

Hampshire Aircraft Parks

W. J. Stutt to be Lieut. (temporary): March 3.

To be Second Lieuts.:

G. S. Wilkinson, R. S. Burch, A. A. Maxwell: March 3.

SPECIAL RESERVE

Second Lieuts. (on probation) confirmed in their rank:

J. C. Simpson, Cornwall P. W. Jolliffe, Hugh Phillips, John D. Troup, Robert E. H. Daniel, Stanley A. Alder, Thomas L. Collins, Reginald F. Howard, John V. Read, Ernest L. Pegge, Reginald F. Tindall, William C. Stringer, Felix C. Rowe, D. Cushing, M. M. Mowat, W. A. Spratt, G. M. Murray, H. H. McL. Fraser, C. W. Blain, C. A. Lewis, G. F. Underwood, Richard Lionel Burdon-Sanderson.

To be Second Lieuts. (on probation):

Charles Lambert: January 26.
George G. Fiddes: February 5.
Merric W. Bovill: February 14.
D. P. Starr: February 22.
Montague R. N. Jennings, Wilfrid R. Snow, Edward R. Yates, Ivan L. Kight, Francis H. Hodgson, Paul F. W. Bush, H. B. Prior, G. D. Rae, N. W. Morrison, Abdy H. G. Fellowes: February 23.
George R. McCubbin: February 28.

NEW LIGHTING ORDER

A new Lighting Order will come into force in the Metropolitan Police district on March 10. In some respects it is more stringent than the Order at present in force.

In shops lights must be screened to prevent any escape of direct light, or lights reflected from mirrors, etc. In all private houses and premises not otherwise provided for, unless the lights are adequately shaded at their source, light coloured blinds or curtains are no longer permissible. Vehicles must in future carry three lamps, (1) a red light at the rear; (2) two white lamps in front, one on either side. Reasonable time will be allowed owners to procure the necessary lamps. Cycles can comply with the law by using two lamps, and hand carts by using one. There is a special provision to meet the case of stationary vehicles, including cabs on the rank. Wherever there are more than five the lights will have to be reduced for the time being, except in the case of a cab rank, where the first two cabs would retain their usual lights.

Except for the provisions of Section 12, the Order will take effect:—

From 6.30 p.m. till sunrise after March 10,

„ 7.30 „ „ „ during April,

„ 8 „ „ „ „ May,

„ 9 „ „ „ „ June,

and until a further Order is made.

SOCIAL INTELLIGENCE

AN engagement is announced between Captain B. E. Smythies, Royal Engineers and Royal Flying Corps, son of Mr. and Mrs. A. Smythies, of Dolton, North Devon, and Kate Marjorie ("Joe"), younger daughter of Mr. and Mrs. W. A. Gouldsmith, of The Bungalow, Shanklin, Isle of Wight.

STOPFORD—BERKELEY—On February 28, in London, Major George B. Stopford, Royal Flying Corps, only son of Colonel J. G. B. Stopford, to Gladys Eileen, daughter of the late Frederick Berkeley and Mrs. Berkeley, of London.

THE marriage between Miss C. Moyra Shedden and Thomas Farquah Lucas, R.F.C., will not take place.

OMMANNEY—GASCOYNE—On February 29, at Roehampton Parish Church, by Canon Brown, Flight Sub-Lieut. George Gascoyne Ommannney, R.N., son of General A. E. Ommannney, C.B., and Mrs. Ommannney, of Lostwood, Langford, Somerset, to Dorothy Edith Gascoyne, eldest daughter of Captain W. W. and Mrs. Gascoyne, of Westwell, Ashford, Kent.

D.C.M. AT MESSRS. RUSTON, PROCTOR AND CO.—Private F. Hibbs, of the Lincoln Territorials, who won the D.C.M. in the attack on the Hohenzollern Redoubt, was on February 26 presented by the directors and staff of Messrs. Ruston, Proctor and Co., where he was employed before the war, with a purse of gold and an illuminated address.

MISHAP IN MID-AIR—While Mr. H. G. Hawker was flying a "Baby" Sopwith biplane at Brooklands on Sunday (February 27) the cowl of his engine blew off in mid-air, carrying away a strut. Mr. Hawker, however, effected a safe landing.

AN AUSTRALIAN FLYING SQUADRON—An offer made by the Australian Commonwealth of an aerial squadron has been accepted by the War Office. Comprising 28 commissioned officers and 180 men, the squadron has already been provisionally organised in Australia, under the command of Colonel Reynolds, who has been head of the Werribee Flying School, and was formerly at Camberley Staff College. The Flying machines, it is stated, will be sent from England to the front.

MILE END ELECTION EXPENSES—At Bow Street Police Court on February 29 a formal declaration was made by his agent that the expenses of Mr. Pemberton Billing, the unsuccessful candidate at the recent Mile End election, amounted to £564.

RESTRICTIONS ON KITE FLYING.—The Regulation (25) made under the Defence of the Realm Act to prohibit signalling without lawful authority is amended by an Order in Council, published in the *Gazette* of March 1, so as to include the sending up of balloons or the flying of kites which are "of such a nature as to be capable of being used as a means of signalling."

THE KENTISH AIR RAID

Captain Bennett-Goldney, M.P., addressing a meeting of his constituents at Canterbury on February 24, referred to the Kentish air raids. He said: You will have noticed that Mr. Tennant from his place on the Front Bench informed the world two days ago (February 22) that some of Mr. Bennett-Goldney's statements were wholly without foundation. What I have to say in reply shall also be heard in the House of Commons. Meanwhile I retract nothing; I vouch for the truthfulness of everything I stated, and were it not that I hold the opinion that a discussion about details is not desirable at the moment, I could add a great deal to what I did say. Mr. Tennant fears that any disclosures of inefficiency of the kind are likely to depress the public. The public is far more likely to be depressed by the uncomfortable feeling which has been long gathering strength that they have been misled and lulled into a feeling of false security by the soothing assurances of past Ministers that everything is satisfactory with our Air Services.

MR. BILLING CONTESTS EAST HERTFORD

Mr. Pemberton Billing has decided to contest the vacancy created in East Hertfordshire by the resignation of Sir John Rolleston.

This decision, Mr. Pemberton Billing stated, is in conformity with the pledge he gave to the electors of Mile End to fight the next by-election in any constituency within reasonable distance of London on the policy of Great Britain's supremacy in the air. He added that after the confessions of Ministers in the air debate of our hopeless unpreparedness he felt it a public duty to endeavour to secure election and so put his experience at the service of the House of Commons. Mr. J. Brodie Henderson, of Hemel Hempstead, is the Unionist candidate.

SOCIETY OF MOTOR MANUFACTURERS AND TRADERS

A meeting of the Aero Committee of the above Society was held on February 16, when there were present:—Mr. H. White-Smith (in the chair), Messrs. S. D. Begbie, R. O. Cary, F. May, A. Pedler, G. Holt-Thomas, H. T. Wright, and Major Wood. In attendance, the Secretary.

CONTROLLED FIRMS AND EXCESS PROFITS—The Chairman reported proceedings at the meeting of the Special Committee, so far as concerned the question of any representation to be made to the Minister of Munitions affecting this Section. The wording in the letter to the Minister bearing on this point was read, and the same not being considered sufficient, it was resolved to request

the Management Committee to send a further communication to the Ministry, making it more explicit that the aircraft manufacturers were separately represented.

FINANCE ACT, 1915—The Chairman read the draft communication to the Chancellor of the Exchequer drawn up by the Sub-Committee, which was approved. Correspondence from members was read, and the Secretary directed to point out the position, which was covered by this draft.

RAILWAY RATES—The Railway Clearing House had informed the Board of Trade that, in spite of the arguments put forward by representatives of this Committee at meeting convened by the Board, and examples furnished of methods of packing aeroplanes and parts, they were not prepared to make any alteration. In view of the fact that these rates are at present being paid by the Government, the matter was not urgent, and it was resolved to settle at next meeting the reply to the Board.

PETROL PRICES—The prices now ruling for motor spirit practically all over England and Wales are as follows:—Shell, 2s. 2d.; Shell II., 2s. 1d.; Crown, 2s.; Red Line, 2s. 5d.; Red Line II., 2s. 4d.; Pratt's, 2s. 6d.; Pratt's II., 2s. 5d.; Taxibus, 2s. 4d.; Mex, 2s. 4d.; Ensign, 2s. 3d. The price of these brands averages in Scotland a penny higher, and in Ireland it varies according to the district.

BOOKS RECEIVED

"THE BRITISH JOURNAL PHOTOGRAPHIC ALMANAC AND PHOTOGRAPHER'S DAILY COMPANION, 1916." London: Henry Greenwood and Co., 1916. 982 pp. Price 1s. net.

"AIRCRAFT IN PEACE AND WAR." W. A. Robson. London: Macmillan and Co. 1916. 126 pp., illus. Price 2s. 6d.

"THE MOTOR CAR RED BOOK, 1916." C. W. Bersey and W. V. Foucard. London: Technical Publishing Co., 1916. 226 pp. Price 5s. net.

"ZEPPELINS AND SUPER-ZEPPELINS." R. P. Hearne. London: John Lane, 1916. 158 pp., illus. Price 2s. 6d. net.

"JOURNAL OF THE AERONAUTICAL SOCIETY OF AMERICA." Vol. I., No. 1. New York: Aeronautical Society of America. 14 pp.

"WAR INVENTIONS. HOW YOU CAN ASSIST." London: J. S. Withers and Spooner, 1916. 8 pp.

PATENT INFORMATION

This list is specially compiled for AERONAUTICS by Messrs. Rayner and Co., Patent Agents, of 5, Chancery Lane, London, from whom all information relating to Patents, Designs, Trade Marks, etc., can be obtained gratuitously.

LATEST PATENT APPLICATIONS

- 2,218 G. E. Bradshaw. Aeroplanes. 15/2/16.
- 2,363 C. A. Moore. Aircraft or aerial torpedoes. 17/2/16.
- 2,518 T. M. Ritchie. Airship envelopes, balloons, etc. 19/2/16.
- 2,408 A. V. Roe. Belt for aviators, etc. 17/2/16.
- 2,334 G. J. Wood. Anti-aircraft shell. 16/2/16.

SPECIFICATIONS PUBLISHED THIS WEEK

- 8,589 Schimmim. Bomb for aero-maritime warfare.
- 14,376 Vasserot. Sighting apparatus for use in discharging bombs from aircraft.

LATEST PUBLISHED ABSTRACT

- 21,602 "Aeronautics." W. M. James, 1, Rochdale Road, Middleton, Manchester. The aeroplane is provided with a number of supporting planes arranged symmetrically along the body fore and aft of a central pair of planes. The normal dihedral angle of the pairs of planes increases successively from zero at the central pair to a maximum at the end pairs of planes. The dihedral angle of one or more pairs of planes at each end of the machine may be adjusted and the controlling cords are arranged so that as the dihedral angle of one pair is increased

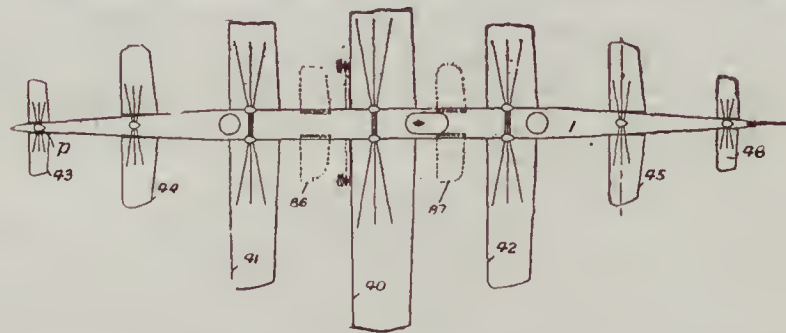


Fig. 8

that of the corresponding pair at the other end of the machine is decreased. In the arrangement shown in Fig. 8, three pairs 40, 41, 42 of fixed planes and four pairs 43, 44, 45, 46 of planes adjustable about axes parallel to the line of flight are arranged on the body of the machine. The planes of each adjustable pair are connected together by brace wires.

Full copies of the specification can be obtained from Messrs. Rayner and Co., at the price of 1s.

AERONAUTICS

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ONE PENNY

POLITICS OR EFFICIENCY?

Aviation to-day in England labours under a disadvantage of immense magnitude, which may be summed up as lack of purpose and concerted action. So far as the purely commercial aspect of the question is concerned, the statement is true enough for every country. But the evil lies deeper; in our own case it is rooted in the attitude of authority as represented by the Admiralty and the War Office towards aerial navigation. The moment when a new force arises which may gravely affect national safety is surely that above all others when clear thinking is required. But look how aviation is regarded by the authorities that be. The War Office, through its official mouthpiece, regards it in the light of an adjunct to the equipment of the Expeditionary Force, the Admiralty as an addition to the naval establishment. By neither is the question considered in the only light possible—that of a serious national issue with which the fate of the country must ultimately be concerned.

It is this fact more than anything else that really constitutes the peril of the air to-day; it is the realisation of this truth which will compel us sooner or later to co-ordinate all efforts, and establish aviation as an integral part in the scheme of national defence under one supreme and competent controlling hand. An Air Ministry will surely come, though the machinery of Government moves slowly.

* * *

IT is just upon three years ago, before the realisation of impending Armageddon had entered our minds, though storm-signals were neither wanting nor suffered to go unheralded, that I wrote the above passage, which appeared in the hospitable columns of the *Daily Telegraph*. I offer no apology for reprinting it at the present time. My excuse is simply that the present so-called aviation crisis—and the French have had theirs—is not a spontaneous growth, occasioned either by a sudden lack of competence on our part or a stroke of superhuman genius by the enemy. This crisis has been with us since aviation assumed the proportions of a serious proposition; for the last seven years, that is to say. The crisis was due to natural causes which, as I now adduce proof positive, could be clearly foreseen by anyone acquainted with the subject and dowered with a modicum of common sense. The fault was due to the inherent disabilities conferred upon the nation by our political system, which still manages to survive the stress of war. It is late in the day to fix responsibility for past mistakes; since it only behoves us now to remedy the evil wrought by our past misdeeds and deeds of omission.

But one thing must here be said: if we have sinned in the past—as it is now officially admitted—the blame is to be laid primarily at the doors of three men, two of them politicians. When the inner history of military aviation comes to be written, as some day it will, we shall find that the chief obstacles which deliberately prevented the development of the air services were Lord Haldane (who had the

effrontery to take part in last Friday's debate in the House of Lords), his successor, Brigadier-General Seely, and the then Master-General of Ordnance. But let the dead bury the dead. We are rather concerned with the present and the future. After all, it has been the whole system that has been at fault; persons have been rather incidental.

Let one thing be clear: throughout I have attacked the system, and have ever studiously refrained from personalities, however much they may have bolstered up a system which the vital issues of the moment have shown to be rotten to the core, and this in spite of the magnificent zeal, uncomplaining loyalty, and remarkable achievements under disability of every member of the Air Services proper from the lowest to the highest. And the main theme of my indictment is, as it always has been, that the governance of the Air Services has been, as it still is, in the hands of politicians, and that the considerations that control it are derived from political motives. One exception alone can here be made: whatever may have been Mr. Churchill's political failures, however unfortunate his recent outburst, there can never be any question but that in the establishment of the Royal Naval Air Service, which he virtually created and for which he alone was responsible, he was not only actuated by the highest motives, not only rendered the country inestimable service and—though of vital importance, the point seems hitherto to have escaped notice—kept in being the industry which, under persistent (and, it is to be feared, wilful) discouragement from other quarters was languishing, and but for him would have been moribund.

What of the system at which this attack is launched?—launched not for its past misdeeds, but because, in spite of the whole present outcry which the Press has suddenly given tongue to in unison, and which has found vent in the return of Mr. Billing to Parliament as what is in some quarters euphemistically termed the first air member, there is every reason to fear that it is about to be perpetuated.

The chief concrete grounds of dissatisfaction can be readily summarised. Our supply of machines, it is said, is insufficient and inferior in quality to that of the enemy; hence our hard-won ascendancy has vanished. Our anti-aircraft defences have proved a failure, and unable to guard our shores against aerial attack. We have no means of countering the Zeppelin menace. There is no co-ordination between the various branches of the two Air Services, which remain simply ancillary to the Navy and the Army. Above all, there is no responsible head and no central aerial control. Finally—and the point was made both by Mr. Churchill and by Lord Montagu—there has been a noteworthy abandonment of the policy that our best means of defence is the traditional method of attack; a policy which met with such excellent results in the early months of war.

So much for the grievances. What of the remedies suggested? We are asked to build airships with all haste, and to meet the Zeppelin craft for craft. A most praiseworthy project, no doubt, but, it is to be feared, a council of sad perfection, for we have neither the time nor the means at disposal to build a fleet of super-Zeppelins within the space of a few months. Ever so much is being done in this direction which cannot, perforce, be made public; but it may well be pointed out that the argument that Zeppelin can only be met by Zeppelin has about as much validity as that submarine can only be met by submarine. With regard to the supply of aircraft and their relative qualities as compared with those at the disposal of the enemy, it is clearly impossible to deal; sufficient to say that there is not the slightest cause for anxiety on this score.

But on the ground of the organisation and control of the Air Services, by cause of their persisting disunion, recent official statements have in no wise succeeded in allaying legitimate disquietude. The Government, soaked in precedent and in tradition, sought to set our minds at rest, characteristically enough, by the appointment of yet another Committee. Here, we promptly thought, we have at last the nucleus of single, unified aerial control, and joyfully we echoed Franklin's cry when first he beheld a balloon: "It is an infant; but it will grow." But deception was not long to follow. The composition of this Committee remains indeterminate; its functions are strictly limited; it possesses no executive capacity; above all, it is, so far as can be discovered by any rational being, responsible to no one. We are as far from any radical reform, it would seem, as ever. True, the crisis has produced some interesting debates in both Houses, conducted, we may be sure, with all the Parliamentary skill and decorum in debate with which we are all familiar; we have been treated to a firework display of unusual brilliance. As a well-known journalist, referring to the subject on Sunday, remarked: "Much good may it do us in the war."

TITLE-TATTLE. By I. C. RED.

HAVING dealt exclusively last week with every conceivable point connected with the wretched things which the muddle-headed chocks at the Establishment are pleased to call aeroplanes, nobody who knows me will be surprised that I am returning to the subject again this week. *Ad nauseam* (Latin) is my motto.

Mind you, I am not writing my own opinions. Lord, no! (Being on paper, my expletives have to be chosen carefully.) As a matter of fact, they are the views of a young probationary flight sub-lieutenant friend of mine who got his commission yesterday and came in to have a chat. Unfortunately, he has not got such a facile pen as I have, so I am doing the job for him. Besides, it is rather useful to have somebody to lay the blame on. Which reminds me of a story of an Irishman, but as I cannot remember the end I will not write it down. Anyway, it had not anything to do with the subject, but it would have filled up space.

There is no doubt about it that we are going the wrong way to work by letting a lot of α chasers and slide-rule mongers crab all the ideas that my friends would have thought of if they had had time.

My young friend tells me that the other day that rotten product of the Establishment, the N.B.G.O., actually nose-dived when the pilot fell out! Now, I ask you, could that have happened in a machine built by one of my friends? Of course not! It would have done a beautifully stable tail-slide.

Apropos of that, I am amazed to see that Mr. A. V. Iator has had the audacity to write to a scurrilous contemporary saying that he did not say what I said he said about the N.B.G.O. Now, again I ask you, is that a pally thing to do? How can I be expected to run my paper when people let me down like that? Besides, he had not even the decency to send it here, so that I could spoil the thread of

East Herts

Mr. N. P. Billing is to be congratulated on the result of the East Herts election, the more so since his large majority exceeded all reasonable expectation. Whatever opinion one may hold regarding Mr. Billing's candidature, one cannot but pay tribute to his pluck and determination. Otherwise his return in no way affects the views previously expressed in these columns on the propriety of making the country's aerial defence a cheap electioneering issue at the present time and bringing it on to the hustings. Nevertheless we look forward with a considerable amount of interest to his forthcoming Parliamentary progress.

The Fading of the "Cryptogam"

Readers will, I feel sure, forgive me for referring a last time to the slow disintegration of this interesting plant, whose chief property, the dictionary informs us, is the fact that it "has its fructification concealed." It is some months since a recent specimen of the genus cryptogam, variety Aeronautical Institute, came into being and delicately reared its tender little head. Carefully we watched its growth, and, alas! only too soon foresaw its inevitable decay. The institute was launched into a hard world with an executive committee of four—Sir George Greenhill, Professor G. H. Bryan, Mr. Charles Bright, and Colonel F. N. Maude. Professor Bryan was the first to resign, and now, alackaday! comes the following intimation:

Sir George Greenhill and Mr. Charles Bright desire it to be known that they have requested their names to be withdrawn from the Executive Committee of the Aeronautical Institute.

So now only Colonel Maude is left. May we anticipate his resignation also? And, if not, may the public at last be informed by him what the Institute really is, what is the exact nature of its work, and to what precise use it intends to apply the money it is busily endeavouring to extract from the public pocket? Meanwhile I am pleased to note that Lord Montagu found himself unable to take the chair at last week's meeting.

J. H. L.

his argument by scattering my comments through it, but goes and gets it put in a rag like that. That shows you the sort of chap he is. Anyway, he is a liar. It is easy to see the chap is no gent. If he had been educated at an elementary school and passed the IVth standard he would not have done a trick like that.

"Taisez-vous, mefiez," as Cæsar said.

That is the worst of letting into the services a lot of beastly upstarts who do not know whether they are descended from Adam or the serpent.

What we want is an Air Minister—somebody like my pal Memberville. Memberville's willing, I know—he told me so himself; and if he writes anywhere to deny it he is a liar, too. So there!

Any fool who writes to point out that I wrote the exact opposite a year ago will get properly strafed in next week's issue, I promise you. Besides, now I am right whatever happens. I am always right. The sky is never so grey that I do not see red.

Another young friend of mine—I am sorry I cannot tell you who he is, but he tells me he is somebody very important—says that our chaps at the front never go up now. He says that it is all blither about our aerial supremacy. As a matter of fact, all the German machines are 30 miles an hour faster and can climb 500 ft. a minute better than the best we have. He knows it is true, because a girl he met in the tube told him so.

Now, haven't I always told you that that silly lot of equation mongers at the Establishment would spoil our chances? Of course I have. As a matter of fact, I know that the particular squadron my young friend's friend is referring to have no Establishment machines; but that does not affect my argument. Nothing affects my arguments.

REPORTS ON WIND TUNNEL EXPERIMENTS IN AERODYNAMICS

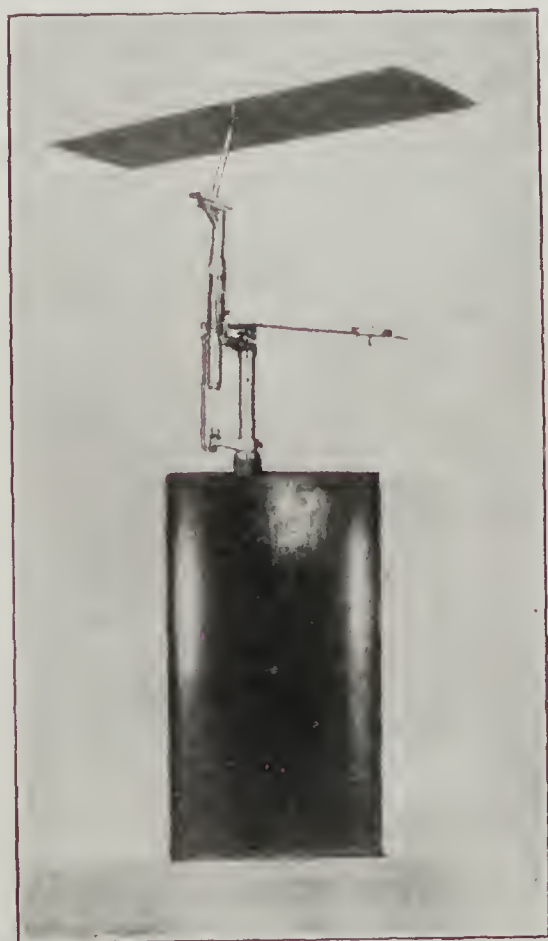
II.—THE WIND TUNNEL OF THE MASSACHUSETTS INSTITUTE OF TECHNOLOGY

By J. C. HUNSAKER, Assistant Naval Constructor, U.S. Navy Instructor in Aeronautics,
Massachusetts Institute of Technology

(Continued from page 161)

DETERMINATION OF WIND DIRECTION IN THE HORIZONTAL PLANE

As a first approximation, the wind was assumed parallel to the axis of the tunnel. A vertical flat plate was mounted on the balance arm and carefully set parallel to a line drawn on the floor of the tunnel in the direction of its axis. The plate was inclined 8 degrees to right and left of this position and the transverse force measured on the balance. The observations were repeated for 6 degrees and for a second plate to eliminate errors due to irregularities in the plates. The transverse force on one side was greater than on the other, indicating an error in the assumed wind direction. A new line was drawn on the tunnel floor, making an angle of 0.3 degrees with the original line. The observations for transverse force were repeated. It was then found that



MODEL WING MOUNTED IN WIND TUNNEL ON
MOMENT DEVICE OF BALANCE

the average of transverse force readings taken for equal angles to right and left of mid position differed 0.5 per cent. from the mean of all readings. The extreme error of one observation, including the error of 0.5 per cent. due to lack of sensitivity of the balance and the personal error of the observer, may then be as great as 1 per cent. in case the two errors are cumulative.

It is not considered practicable to obtain a closer setting with the methods of alignment employed.

SETTING ARMS OF BALANCE

Knowing the true direction of the wind, it is necessary to set the horizontal arms of the balance parallel and perpendicular to this direction. To do this the floating part of the balance was rotated by an adjustment provided by the design until the force recorded on the "drift" arm (the resistance)

was equal for equal angles of the plate to right and left of the wind direction. The final setting indicates a remaining error of 0.2 per cent.

After making the slight adjustment required here, the a pressure-tube anemometer, commonly called a double to be increased.

MEASUREMENT OF AIR VELOCITY

The velocity of flow in the wind tunnel is measured by a pressure-tube anemometer, commonly called a double Pitot tube.

Our laboratory standard is a double Pitot tube presented by the director of the National Physical Laboratory, England. This tube was compared with the National Physical Laboratory standard which had been calibrated on a whirling arm by F. H. Bramwell.* Its constant had been determined to be unity to a precision of 0.1 per cent. Our tube was compared with it by a method allowing a precision of 0.25 per cent. A discrepancy of about 0.25 per cent. was found. Its readings may then be taken as correct to this degree of precision. In all cases a uniform rectilinear current is implied.

The Pitot tube, in common with all anemometers, has the disadvantage of obstructing the channel, and where models are to be tested the channel should be kept entirely clear. The expedient of using a side hole in the channel is due to M. Eiffel.†

In a channel of uniform section air is forced to flow practically parallel to the axis of the channel. Hence stream lines are all parallel, and across any section taken normal to the channel axis there should be no component of velocity at any point. This statement is of course true only for a steady, uniform flow free from turbulence. The static pressure should be constant across a section, for if pressure differences existed there would be a transverse flow of air created. Tests in our wind tunnel showed constant pressure across a section to a good approximation. Incidentally the constancy of this static pressure across a section is a measure of the uniformity of flow.‡

A small hole in the side of the tunnel can then be used to measure the static pressure, but the dynamic pressure measured by the impact end of the Pitot tube is

$$p + \frac{\rho v^2}{2g} = p_0, \text{ by Bernoulli's equation,}$$

where

p = pressure at any point in a stream line.
 v = velocity at any point in a stream line.
 ρ = density at any point in a stream line.
 p_0 = pressure where v is zero.

* Technical Report of the Advisory Committee for Aeronautics, London, 1912-13.

† La Résistance de l'Air et l'Aviation, Paris, 1912.

‡ The static holes of the National Physical Laboratory Pitot tube were connected to an alcohol gauge, and the velocity being kept constant, the tube was moved along the vertical centre line of the tunnel. The following readings were taken:—

Head in $\frac{1}{2}$ mm. alcohol	Distance from wall
440.2	3"
438.0	6"
439.5	12"
439.8	18"
439.5	24"
441.2	30"
441.0	36"
441.0	42"
441.2	45"

In our wind tunnel a fan sucks air through the tunnel, which is therefore all under suction. The air is discharged by the fan through a strainer into the building at one end, whence it returns at low velocity to the other end, to pass again into the tunnel. At a point in the room the pressure transmitted by an impact tube would be

$$p_r + \frac{\rho v_r^2}{2g} = p_o.$$

But the room is 30 times as large as the section of the tunnel, and when a wind of 30 miles is blowing in the tunnel there is only a gentle draught in the room of about one mile per hour. Thus the ratio $\frac{v_r^2}{v^2} = \frac{1}{900}$ and the pressure in the room can be taken as

$$p_r = p_o = p + \frac{\rho v^2}{2g}$$

neglecting v_r^2 .

If then we connect a hole in the side of the tunnel with one end of a liquid manometer, and leave the other end open to the room, the gauge reading is proportional to the difference in pressure or to

$$p_r - p = p_o - p = \frac{\rho v^2}{2g}.$$

The reading of the manometer thus is a measure of the velocity.

Due to loss of head from friction in the mouth of the tunnel and in the honeycomb, the relation

$$p_r = p + \frac{\rho v^2}{2g}$$

is not strictly true. An unknown loss in friction would be represented by adding a term to indicate the friction head pressure. Then

$$p_r = p + \frac{\rho v^2}{2g} + p_f.$$

The use of the side plate method ignores the effect of p_f . A comparative test showed an error of 3 per cent. when velocity was calculated from side plate readings. It is, therefore, necessary to calibrate the side plate and its manometer against the standard Pitot tube and its manometer.

The side plate used (fig. 6) consists of a thin brass disc about 3 in. in diameter set flush in the wall of the tunnel. The disc is flat and highly polished. Near its centre five

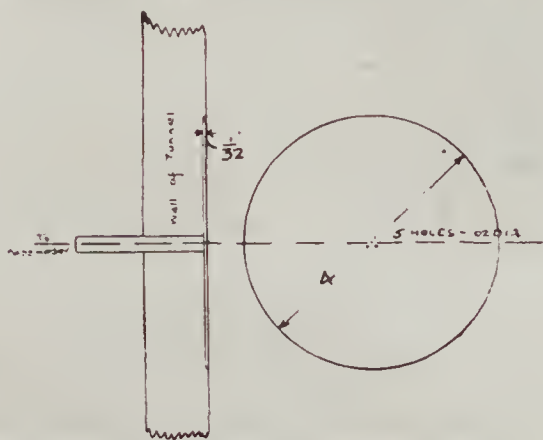


Fig. 6. SIDE PRESSURE PLATE

holes 0.02 in. in diameter are drilled. These holes are connected with a brass tube soldered to the back of the plate and projecting through the side of the channel. Rubber tubing is used to transmit the static pressure from the small holes to one end of a manometer. As explained above, the other end of the manometer is open to the air in the room.

The pressures transmitted by the side plate have been found to respond very quickly to changes in velocity, and the method is even more sensitive than the Pitot tube. Naturally its precision is no better than that of the Pitot used for its calibration.

The pressure difference transmitted by the side plate is read on an inclined alcohol manometer on the Krell principle. Both the side plate and this alcohol manometer require calibration against a standard. For convenience the side

plate and its manometer were calibrated together against the standard Pitot tube and a Chattock manometer.

The standard National Physical Laboratory Pitot tube was mounted in the centre of the tunnel in the place where models are tested. This tube was connected to the Chattock gauge. The side plate in the wall opposite the tube was then connected to the alcohol gauge. The wind speed was then adjusted to 2, 4, 6, 8, etc., up to 40 miles per hour and both gauges read. Some 100 readings were taken. From the Chattock gauge readings the true speed was taken from its calculated curve (for standard air). The readings of the alcohol gauge were then plotted on true speeds. The curve so made was then a calibration of the side plate and alcohol gauge in combination. The Pitot tube and Chattock gauge may now be removed, and in future model testing the alcohol gauge readings may be used to measure the velocity at the centre of the tunnel.

It is shown below that the velocity over the section varies about 1 per cent. over a 2 ft. 6 in. square at the centre of the tunnel.

CHATTOCK MICROMANOMETER

The Chattock gauge mentioned above has been adopted as our laboratory standard, but is used only for the calibration of other gauges which may be preferred on account of ease of reading. The following notes on this gauge are introduced here in the hope that someone may have use for a delicate pressure gauge. Working drawings will gladly be supplied to anyone contemplating the construction of such a gauge.

The Chattock micromanometer was devised by Professor A. P. Chattock and Mr. J. D. Fry for the precise measurement of very small pressures. The gauge is described by Dr. T. E. Stanton in the *Proceedings of the Institution of Civil Engineers*, December, 1903. Dr. Stanton used this gauge in his experiments on the air resistance of small plates.

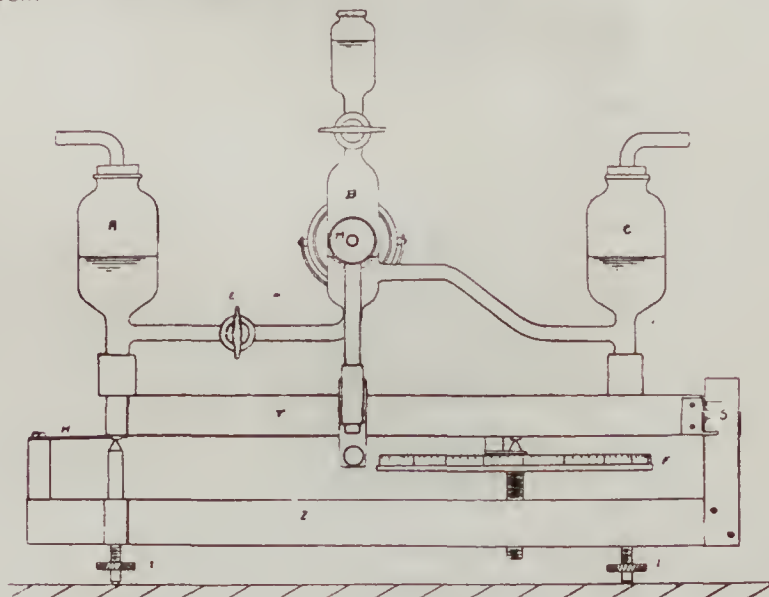


Fig. 7. CHATTOCK MICROMANOMETER

The principle of the gauge is that of the inclined liquid U-tube, but, instead of giving the tube an initial pitch and observing the change of level of the liquid, the Chattock gauge is fitted with an elevating screw and micrometer, by which the gauge is tilted to balance the pressure difference in its two ends. By reading on the micrometer the amount of tilt given, the head in inches of liquid is computed. By this means there is no motion of the liquid in the glass, and errors due to capillarity and viscosity are eliminated. Furthermore, the condition of the surface of the glass has no effect.

The gauge (fig. 7) consists of a glass U-tube mounted on a tilting frame *T*. The pressures to be measured are connected to the bulbs *A* and *C*, which are in communication with each other through a horizontal tube bearing a third bulb *B* at any intermediate point. The bulbs *A*, *C*, and the lower part of *B* are filled with water. The upper part of *B* is filled with castor oil. The water in *B*

and *C* is in free communication, and hence the oil in *B* is at the pressure of *C*. The water in *A* is led through a thin walled tube through the bottom of *B*, extending into the castor oil. An excess of pressure in *A* over the pressure in *C* will cause water to flow from *A* into *B*. A water bubble will then grow at *D* and expand into the oil. The gauge can be tilted so that this bubble remains of uniform diameter. The pressures in *A* and *C* are then balanced. To provide this tilting the manometer proper is mounted on a tilting frame *T*, which pivots on the knife edges at *G*, and is elevated by the screw *F*. The whole is carried on a bed frame *Z* fitted with three levelling screws *I*, a retaining spring *H*, and a scale *S*, on which may be read the full turns of the screw *F*.

A microscope, *M*, fitted with cross-hairs, is mounted on

portable, and in taking a reading an approximate balance is made with *E* partly opened. The cock is then opened full.

The gauge is filled with a solution of salt and water of s.g. 1.06. The addition of a little salt keeps the castor oil from growing cloudy.

Two gauges were constructed—one by a skilled glass blower and the other by a student—with a view to determining the effect of workmanship and dimensions. The frame and stand were made identical in the two gauges, but the glass work was purposely altered. The tip of the tube at *B* was ground to a knife edge in one gauge and in the other ground off square. One tube was .20 in. in diameter and the other .15 in. in diameter.

The two gauges were connected to the same static pressure and gave readings identical to 0.25 per cent. It was found

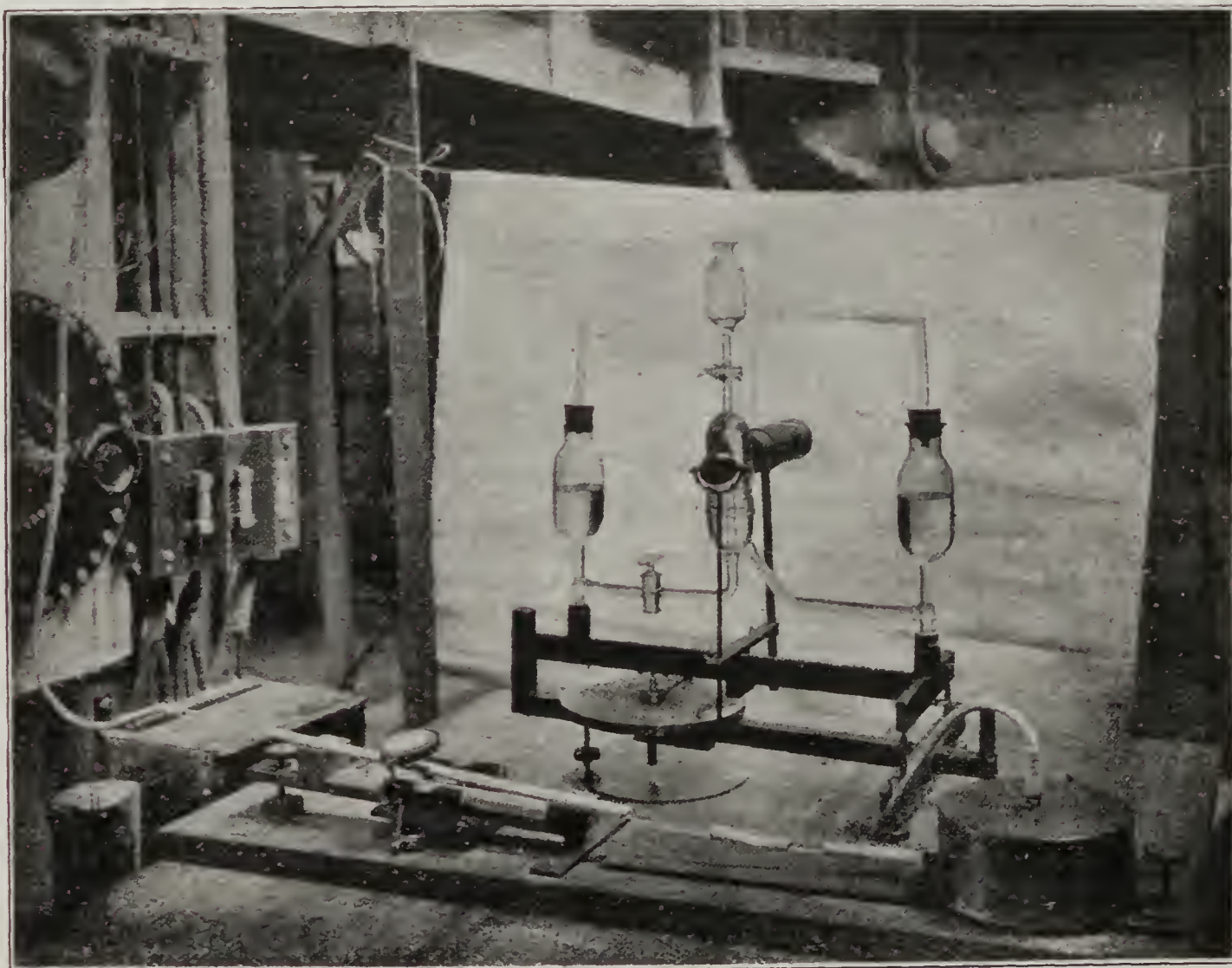


Fig. 8. CHATTOCK GAUGE AND ALCOHOL GAUGE, USED FOR VELOCITY MEASUREMENTS

the frame *T* and directed at the bubble *B*. A small mirror on the opposite side illuminates the surface of the bubble.

The screw *F* is fitted with a large drum divided into 100 parts. The screw has 20 threads to the inch. The gauge is sensitive to one-half of a division on the drum, and hence to a movement of the screw of $1/4000$ in.

Before a measurement is taken, the bulbs *A* and *C* are opened to the air of the room and the frame tilted by moving the micrometer until the top of the bubble *B* is brought tangent to the horizontal cross-wire of the microscope. This is the zero reading. The bulbs *A* and *C* are then connected to the two parts of a Pitot tube and the frame tilted until the bubble is again on the cross-wire. The amount of tilt is then read on the micrometer.

Naturally too wide an excursion of the bubble will result in its rupture. The loss of a bubble transfers a drop of water from *A* to *B*, and hence a new zero reading must be found by balancing up again. To avoid sudden change of pressure and breaking of the bubble, a stop cock at *E* is fitted. This cock can be closed to make the instrument

that the gauge in no way is affected by minor variations in workmanship.

In the gauge with the ground knife edge tip it was found that the bubble did not break so readily as in the gauge with the square tip. It was suggested by Professor Gill that the tenacity could further be increased by coating the outside of the tube below the bubble with paraffin. This was tried, and was found to be of great assistance. A height of bubble from three to four times the diameter of the tube at its base could be allowed without rupture. The reason for this is to be found in the fact that castor oil sticks very tight to glass, but will not stick to paraffin. By the use of this wax the bubble could not creep over the edge of the tube and so slide down it, causing a break. However, any large excursion of the bubble is to be avoided, as tending to cause a slight change in the zero reading. In all tests the zero should be taken at intervals. The effect of the paraffin on the tip could not be detected in the readings of the gauge.

The consistency of the gauge readings with these various alterations in the base of the bubble, as well as in the size

of the bulbs and connecting tubes, gives great confidence in this type of gauge. It was not possible to calibrate this gauge experimentally, because there was no other gauge available to measure it against which was equally sensitive. However, we have Professor Chattock, Dr. Stanton, and the National Physical Laboratory as authority for the calibration of the gauge by calculation from the dimensions of its parts and the density of the liquid. It may be noted that the density of the oil used has no effect on the principle of the gauge and is not considered.

For the calculation of tilt, it is then necessary to measure the distance between the centres of the bulbs *A* and *C*, and the distance from the knife edge *G* to the screw *F*. An error of 0.1 in. in either of these measurements is an error of 1 per cent. in head or 0.5 per cent. in velocity. There is no difficulty in getting these distances to the nearest hundredth of an inch. The screw thread was cut so precisely that it was impossible to detect any error in the pitch of the thread. The hole in *Z* was tapped with a standard Brown and Sharp tap. The calculation of the change in level of the surfaces of the liquid in *A* and *C* is precise to 0.1 per cent. The density of the solution was taken on a Westfall balance to the same degree of precision.

Since the gauge is sensitive to less than 0.1 per cent. for
(To be continued)

heads of more than 0.3 inch, the measurement of velocity depends on the precision of the Pitot tube. The latter is good to probably 0.25 per cent. in velocity. However, the air current always has some fluctuation at high speeds, so that in the end the velocity measurement is limited in precision by the closeness with which such fluctuations can be averaged. In a very steady current, such as our wind tunnel, it was found that the error in estimating velocity was less than 0.5 per cent. The average of a number of observations is, of course, better than this.

Change in density of the salt solution is $\frac{1}{3}$ per cent. for a change of 60 degrees F. in temperature. A temperature correction is ordinarily unnecessary.

An alcohol gauge is a sensitive and consistent instrument, but requires calibration to eliminate errors due to viscosity and capillarity. The question of its suitability for precise work will be discussed later in another paper. It has the great advantage over the Chattock gauge in that it requires no delicate manipulation to get a balance, no cross-wire and microscope, and with it it is possible to estimate the mean of fluctuations. The alcohol gauge has been successfully used to measure air speeds as low as two miles per hour. It is shown with the Chattock gauge in Fig. 8.

PROGRESS OF AMERICAN AVIATION

By ERNEST L. JONES, American Editor

MILITARY AVIATION IN THE U.S.

NO one knows as yet just what will be done with regard to aviation in the present argument in Congress for and against preparedness. There seems to be no present prospect of getting an appropriation large enough to cover eighteen squadrons of thirty-six machines each.

It is expected that the minimum programme of seven aero squadrons of twelve machines each will go through. Below we give the plans as suggested by the Chief Signal Officer in hearings before the Senate Military Committee. No one knows what the committee will report to Congress. The appropriation asked for of \$1,358,000 (£271,600) merely meets the needs of the aviation section as it exists to-day.

MINIMUM REQUIREMENTS

In hearings before House and Senate Military Affairs Committees it was brought out by Brig.-Gen. George P. Scriven, chief signal officer, and Lieut.-Col. Samuel Reber, head of aviation, that the following programme of seven aero squadrons and a school detachment is the absolute minimum in case the Army remains approximately at its present strength:

Overseas.*				
	AERO SQUADRON	OFFICERS	MEN	MACHINES
Philippines ...	1	20	129	12
Hawaii	1	20	129	12
Canal Zone ...	1	20	129	12
United States				
Mobile Army (4 Divisions)	4	80	516	48
Administration	—	2	—	—
School Detach- ment	—	6	77	8
		—	—	—
		148	980	92

The Chamberlain Bill recommends changes in the aviation law to accomplish the following desired objects:

To remove the limitations of age and conjugal condition.

The present law limits detail of aviation students to such unmarried lieutenants as are under thirty years of age. This law makes eligible but 6.4 per cent. of first and but 34.4 of both first and second lieutenants.

To remove the increase of rank now given to qualified

aviation officers, but readjusting amount of pay received so that it would correspond to the amounts now received.

Each aviation student under this new Bill, while on duty requiring him to participate regularly in flights, to receive an increase of 25 per cent. in pay of his grade and length of service. Each qualified military aviator to receive an increase of 35 per cent., and while participating regularly in flights to receive an increase of 70 per cent. Each aviation enlisted man, while participating regularly in flights or holding rating of aviation mechanic, to receive 50 per cent. increase. No person hereafter to be detailed as aviation officer or rated as military aviator or as aviation mechanic until he has certificate issued by aviation examining board of three officers of experience in aviation service and two medical officers.

Widow of officer or enlisted man in case of aviation accident to receive one year's pay. In case of disability received in aviation duty, the amount of pension to be doubled.

The Bill, of course, provides for the complement of 146 officers and 980 men mentioned in the above table, officers to serve for four years, and charges the aviation (*sic*) section with the duty of operating with all military aircraft, including balloons, the above figures being in addition to such officers and men as shall be assigned from the Signal Corps at large to executive, administrative, or scientific duty for the aviation section.

The Chamberlain Bill, in providing for these 146 officers and 980 men, includes the present aviation section put into being by Congress July 18, 1914, which, however, has never been recruited to full strength, as the age limit and conjugal conditions barred many from entering this branch. The present law provides for only 60 aviation officers and 260 enlisted men; total, 312.

The Chief Signal Officer, in earlier hearings, asked for a total of eighteen aero squadrons, instead of seven as provided for in the Chamberlain Bill. (Each squadron consists of two companies of four aeroplanes each—eight aeroplanes to a squadron at the present time—or should.) The squadron, as urged by friends of aviation and by the Chief Signal Officer, would consist of thirty-six machines, or 648 machines for the eighteen squadrons. Under the minimum plan mentioned before, the squadron would consist of but twelve machines and the squadron would consist of three com-

* Proportional Table; this for seven divisions; same in proportion for more.

panies—two of scout machines and one company with two pursuit machines to counter-attack enemy aircraft, and two weight-carrying machines armed for destructive purposes.

The C.S.O.'s figures, therefore, total up as follows for what the Department considers the smallest lay-out entitled to real respectability:

<i>Overseas</i>				
	SQUADRON	OFFICERS	MEN	MACHINES
Philippines	1	20	129	36
Hawaii	1	20	129	36
Canal Zone	1	20	129	36
<i>United States</i>				
Mobile Army (7 Divisions)	7	140	903	252
3 Coast Art. Dis....	3	60	387	108
5 Field Art.	5	100	645	180
Administration ...	—	2	—	—
School Detachment	—	6	77	8
	18	368	2,399	656

Using the minimum table, it is seen that \$1,358,000 would not cover ninety-two machines (say \$920,000), sheds, tests with various devices, machine-shop trucks, trailers, and the like, and the \$50,000 designed to be used as a prize for motor competition. The estimate was \$4,284,000 for the eighteen-squadron plan. The cost of a squadron of only twelve machines is about \$384,000. Seven of these, under the minimum plan, would cost \$2,688,000. In addition to the cost of machines for a squadron of twelve there are six motor-cycles, twelve aeroplane-carrying trucks (one as machine-shop, one as tank, one with baggage and rations, and nine with supplies). The maintenance of each machine is about \$5,000 a year.

There are now but twenty-three machines in the Army and two awaiting acceptance. Those on hand are all tractor biplanes, scouts, made by either Curtiss or Martin. The best speed obtained is eighty miles an hour. The Curtiss Co. expects shortly to test out a 110-miler, tractor, type.

General Scriven urges an aviation reserve corps to be created from civilian aviators, mechanics, and constructors. Officers of the reserve corps should be qualified pilots of American citizenship who shall have established their fitness under conditions to be established by the Secretary of War, and should be subject to call. On entering the corps the officers should agree to serve at least three weeks each year at one of the aviation stations and receive the pay and allowances while so serving of a first lieutenant. The men should be enrolled as members of definite organisations of the aviation reserve corps, and while so enrolled and while actually engaged or employed in business connected with the operation or manufacture of aircraft or materials should be given pay on a peace basis. Those men called to the colours would receive same pay per grade as the Regular Army.

A RUST-PROOFING PROCESS

A NOTABLE new development in aeroplane construction recently perfected at the plant of the Burgess Co., at Marblehead, has been the installation of a very thorough rust-proofing system for all of the metal parts put into the machines produced. Up to the present time one of the greatest difficulties encountered in keeping flying craft fit has been the rusting of the fittings, and the only method of preventing this has been by means of paint.

But in many ways paint is unsatisfactory. It fails to penetrate the pores of the metal and is easily scratched off by the lightest blow or impact, either from a sharp or blunt surface, or even the toe of a boot. Then the rust makes rapid headway, especially in the case of hydro-aeroplanes or seaplanes used on the salt water. In many cases, in fact, the exposure of a bare metal surface to alternate action by salt water and air for only a few hours will seriously weaken the part in question.

With the object of overcoming this handicap in the use of metal, the Burgess Co. has been experimenting some months with various systems of rust-proofing, and has evolved a very satisfactory solution. Some of the parts so treated have been hung at half-tide mark for ten days—a much severer test than complete submergence for that time—and at the end of the test have shown no signs whatever of rust or erosion of any kind. This system, used at Marblehead for the first time in aeroplanes, undoubtedly lengthens the life of the machine so treated by many months.

One of the important features of the process is the fact that it penetrates rather than coats the metal, and as a result may be used for bolts, nuts, and threads of all kinds without destroying the fit. Every metal fitting, of the smallest description, is treated with this process. The system, in brief, is an oxide treatment with chemical preparations which requires from a couple of hours to half a day in the case of the largest parts. The process is the invention of Henry C. Bains, of Springfield, and gives a dark finish very similar in appearance to gun-metal.

LOS ANGELES COMPLETES AERO SECTION

Enlistment has been completed for the aeronautic section of the 9th Division of the Naval Militia at Los Angeles, California. The section consists mostly of men who have had considerable experience in aeronautics. Among them are four pilots, and two of the men are engaged in construction work on new army tractors being built by the Glenn Martin Company. Mr. Martin is acting as supervising instructor to the section, and after receiving considerable theoretical instruction at the Armoury, the section gets practical instruction and flights in Martin army tractors. Considerable experience has already been gained by using the Signal Corps in communicative work. The section has, as yet, no planes.

THE NAVY AERONAUTIC STATION

The weather during the week ending February 15 at the Navy Aeronautic Station, Pensacola, Fla., was excellent, and the machines available have been flying continually. The total time for the week was 99 hours and 24 minutes, or the equivalent of 6,000 miles of direct flight. Lieut. R. W. Cabaniss and Lieut. (J.G.) N. B. Chase, Chief Turret Captain A. A. Bressman and A. F. Dietrich, B.M., 2nd Class, U.S.N., have each made their first flights alone. Lieut. (J.G.) W. M. Corry, U.S.N., made his first flight alone in the flying boat type of aeroplane. Lieuts. (J.G.) P. N. L. Bellinger and W. Capehart, U.S.N., made a series of bomb dropping tests, using AH-10 for this purpose. Lieut.-Commander H. C. Mustin, U.S.N., with Lieut. (J.G.) W. M. Corry, U.S.N., as observer, made a scout of 35 miles out to sea. Lieut. R. C. Sausley U.S.N., has been conducting some experimental flights in AH-16 in order to test out the flying qualities of this machine under various conditions of flight. The hydrogen plant for the manufacture of hydrogen for the inflation of balloons and dirigibles has been completed.

THE LATEST

The following communication has been received from a correspondent in America:—

"Major M. T. Bane one fo Peoria Illinois Most Intrested Balloon Men is Still In the feald for Searvis Other than a Membor Of the Peoria Aerio Club Mr. Bane is the Founder & Manager Of the Prospected Montgolfieres Sphere and Dirigible United Union Ballooning Brother Hood Order The Major Wishes to Make the Anouncement that He would like to hear from 500 Stolwort Men that Will Join With him In a direct appropriation Of Five hundred Dollars Each a Year for a Period Of five Years For the perpos of Erection and Maintenance And Operation a Montgolfieres Dirigible Experimentaly factory And Stashion at Peoria Ills., Mr. Banes Wishes to anounce that he will Open Book for the perpos of recorden all names of partyes that are willing to healp Premot this Big Movment No finance actions will be taken untell the registor record Reach the 500 mark A report of the record Will be given the Editor of this Journal Each month in this Movment The Major is Looking forward In this Movment With all Hoopes of seeing the Prospected Montgolfieres Dirigible Sistim To be put on an Equal With the Big Zeppelin Factory Of the German Government The Major feeals that If he can Pull Off this Big Aeronautic Stunt for Peoria Ills., He Will be able to Wine grate Success for the Prospected Montgolfieres Dirigible Sistom In every State In the U. S., Let Me hear from Men that are Willing to Lend thear Support In this Big Movment Major Martin T. Bane Dana La Salle Co., Illinois
"Rfd 9 Box 3."

RANDOM REMARKS

XL.—STUDIES IN PHYSIOGNOMY By ARTHUR LAWRENCE

Illustrated by ERNEST COFFIN

THERE may have been times when the question "What to do with our boys?" had points of interest, but in later years greater importance attaches to the question if for "boys" we substitute the word "faces." Sime, Raven Hill, Dudley Hardy, and many others have tried their hands at contorting my plastic features, and mostly to my delight. Yet there is a caricature which hangs on the walls of a certain club that I could not abide. I felt that it was the artist who should have been hanged. Some people like seeing their features distorted and some people



don't. I have had the inestimable privilege of gazing upon the manager of this paper. He has appeared to me to be sculptured after the later Greek models. Yet our artist (I am inclined to add an "e" to that word) seems to think otherwise. So far as I am concerned it is very unpleasant to wake up in the morning and find that one is supposed to have the appearance of a combination of a Mile End lag and a Sydney larrikin with a flavour of Hoxton. The nose (in the sketch of the manager) is distinctly prehensile. The question arises whether the monkeys of old time, when reaching after the higher branches, were limited to the use of hands and feet. Is it not highly probable that, notwithstanding the present abridgment of that organ, they used their noses as well? I can see myself delivering an address to the Anthropological Society in regard to this problem. There was once a terrific pianist who boasted that there was no music which he could not play. Whereupon a man composed a short thing which carried the hands to the extreme ends of the keyboard and then maliciously inserted one note in the middle. Nature had provided the executant with a Wellingtonian significance, and when he came to that middle bit he struck the right note with that.

It is a chastening circumstance that I have hit upon an intensely delicate theme. There are but few kerns who will permit you to play about with their features without making an attempt at reprisals. I remember that in the frenzy of my remarks I once violently pulled the nose of a man who could have eaten me. He begged

me, for my own sake, not to do it again. The temptation was well-nigh irresistible, but I refrained. This showed that I could be capable of self-denial if and when the occasion demands it. My editor is the proud possessor of a fine organ. He speaks French much better than the native, and, as is well known, the proper pronunciation of that language cannot be successfully accomplished by people with inferior nasal arrangements. Of my own I can say very little. It is of the order cogitative, and can be screwed up on one side well out of the way if trouble is pending. The artist who is allowed to play tricks with this page is ideally fitted out as a caricaturist. He has great punching powers, and his nose being quite insignificant, his chin nearly absent, and his large and well-groomed ears lying close to his head, he is equally well equipped for defence. In fact, the best way to fight him is to kick him, then lie down at once and call loudly for help. I prefer to be civil.

We are often told that the eyes are the windows of the soul. The other day a friend of mine gave a new complexion to this idea. I took the liberty of telling him that his eyes looked rather bloodshot. "Yes," he said, mournfully, "eyes only seem to exist in order to give one away." The Philistinism of this gave me a shock, which served me aright for thinking aloud. And yet, to men of experience, do not our entire physiognomies give us away? There is sound truth in the adage that first impressions are best. If you don't like "the cut of his jib," act on that instinct, before the man with the bar sinister or the mark of the beast on his forehead



makes use of many devices to ingratiate himself with you. If the man has a vulpine look yet will he bleat like a lamb, but the day cometh when he will act like a wolf. It has always been a great pleasure to me to walk out of a restaurant without settling the bill, merely remarking that I should be round again very shortly. The cheerful reception of this casual statement gives me the comforting assurance that I have what is technically known as an honest face. Very few have one, by reason of the simple fact that they are not really honest.



THE NORTHERN AIRCRAFT ESTABLISHMENT ON WINDERMERE

The photograph was taken from one of the school machines under difficult conditions. Note the steep dive and bank



ON THE SHORES OF LAKE WINDERMERE

Another remarkable photograph, somewhat obscured by the intrusion of one of the seaplane's floats in the picture, of the Northern Aircraft Schools

MODEL AEROPLANES—XXVII

By F. J. CAMM

PROBABLY the present popularity of compressed air as a power plant for models is due in some measure to the fact that the market possessed erstwhile a remarkably cheap and efficient engine, the Bing autoplan, of German manufacture. Now, for obvious reasons, these engines are unobtainable, and no English model aeroplane firm is manufacturing a plant. Accordingly I now intend going fully into the construction of a machine on Caudron lines, driven by compressed air. It has been remarked that compressed air in one important point possesses the same disadvantage as the elastic motor, *i.e.*, the thrust gradually begins to grow less from the moment the container pressure is released. In other words, the thrust is no constant. The fact cannot be disputed, but we will take two concrete instances. A rubber-driven model is carefully designed, and from previous experience we consider, let us say, seven strands sufficient rubber to supply power. We endeavour to fly the model, and find that it is either over or under-powered. Now it is a comparatively easy matter to vary the number of strands to adjust the machine. But take the case of a c.a. model under similar circumstances; we cannot add a cylinder if the model is under-powered, neither is it practicable to reduce the number of cylinders to obviate the opposite contingency. The point is this, the construction of a c.a. model calls for a much closer attention to design, since the power unit is not (unlike the rubber

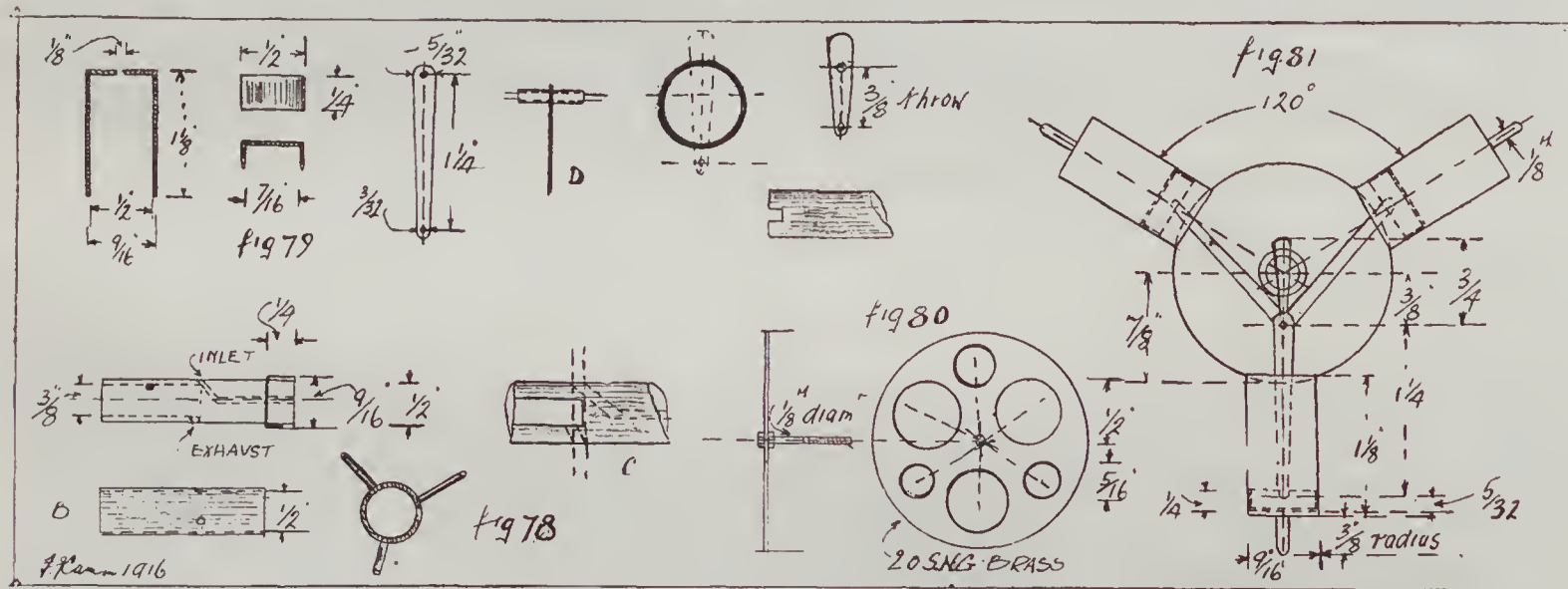
exactly coincide with it. It will, of course, be obvious that with this type of engine the incoming charge forces out the spent one. It will be found advantageous, too, to arrange for the exhaust of the charge of compressed air *before* the piston reaches the bottom of its stroke; thus the exhaust port can be drilled of a diameter one and a half times that of the bore of the inlet pipe.

The sleeve encasing the crank-shaft (see *B*) should be turned to make a good fit around it. The high diametrical limit should be not more than one and a half thousandths of an inch (.0015) over the diameter of the crank-shaft. It is quite easy to work to these fine limits if a micrometer is used.

The three holes (into which the three feed pipes are silver-soldered) must be drilled correctly round the circumference of the sleeve, *i.e.*, at an angle of 120 deg. to one another. An enlarged detail of the inlet port is given at *c*.

The pistons and cylinders are of brass and turned from the solid; the pistons should be .002 under .5 of an inch. Dimensioned sketches are given of them in Fig. 79; the inlet holes in the cylinder heads should correspond in diameter to the external diameter of the feed pipes. Tube of about 3-32nds bore will be found suitable.

The following figure shows details of the connecting rods. From sketch *D* it will be clear that the gudgeon pins pass through pieces of by-pass tubing, which are soft-soldered to the small end of the connecting rod. The detail of the



motor) capable of infinite variation. However, to return to my subject, the plant to be used is similar in many respects to the one previously described in the opening of these articles. It is similar, that is, inasmuch that it is a rotary; the dimensions also are approximately the same. But in other directions, notably in that portion of the crank-shaft which forms the inlet and exhaust valves, several alterations and modifications will be apparent, and these have been introduced in view of the fact that the pistons and cylinders and crank-shaft and sleeve are to be turned in this plant. There seems a prejudice against rotary engines because of a reputed "wastage" of compressed air. Personally the writer has never observed this; undoubtedly the most troublesome portion of any c.a. engine is to make a perfectly airtight inlet valve, but I venture to assert that it is far easier to do this with a rotary than with a stationary.

In Fig. 78 I show the crank-shaft; it will be noticed that a shoulder is turned on one end to provide an abutment for the revolving sleeve. The inner end of it is drilled out on the lathe to provide ample clearance for the exhaust compressed air; this will be found necessary to avoid "back pressure." In order that the inlet port may not foul this orifice it is drilled through at an angle as shown, running into the parallel hole drilled concentrically to receive the feed pipe from the container. The exhaust port must be drilled exactly opposite the inlet port, so that the inlet pipes, when the cylinders are about to exhaust their charge,

gudgeon pin fixture to the piston walls will be given in next week's issue.

The throw of the crank is cut from 20 s.w.g. sheet brass. The stroke of the pistons is three-quarters of an inch, so that the distance between the centre of the crank-shaft and the centre of the journal hole will be three-eighths of an inch. Suitable slots are cut in the crank-shaft end, as shown, the throw being tapped in, and silver-soldered into place.

Silver steel is used for the journal, 3-32nds in diameter. It is threaded on both ends—one receives a small nut (to prevent the connecting rods from becoming detached) and the other screws into the journal hole, wherein it is soft-soldered.

Fig. 80 illustrates the front plate, which is not fixed until all other portions are assembled. The $\frac{1}{8}$ -in. bolt is locked to it by means of two small nuts; the end of the bolt is to be "spread" to prevent it working loose. Care should be taken to see that the bolt grows from the plate truly, so that the propeller, which passes over it, beds home squarely to the plate.

The last figure gives a view of the engine without the front plate. A sixteenth of an inch clearance only is allowed between the cylinder head and piston. Hence, care in assembling is essential to see that this is so. The back plate is also drilled, but details of this, together with further sketches of the component parts, will be given in the next article.

(To be continued)

STATEMENTS IN PARLIAMENT

HOUSE OF COMMONS

March 7. *The Zeppelin Raid*—Mr. Ferens (Hull, E., L.): I wish to ask the Under-Secretary of State for War whether he is aware that on Sunday (March 5) a Zeppelin visited an important city on the East Coast and dropped over 20 bombs, killing 17 people and wounding 50, and whether he will say what steps the Government propose to take for the protection of the people from raids of this kind.

Mr. Tennant: I only learnt of the right hon. gentleman's question as I came into the House, and, therefore, I have not been able to consult my Department as to any future steps that may be taken, and I am quite certain that it would not be desirable to disclose any such steps as might be taken on behalf of the public. We sympathise very deeply with the relatives of the killed and injured, and I hope that the figures given by my right hon. friend are in excess of the facts. (Mr. Ferens and other members: "No.") The information that reaches me is not the same as that which my right hon. friend conveys. For the present I can only express our sympathy on behalf of the Government.

Mr. Hodge (Lancashire, Gorton, Lab.): Would not the best defence be to lay a few German towns in ruins? (Hear, hear.)

Mr. Joynson-Hicks (Brentford, U.): Is the right hon. gentleman in a position to tell the House that the arrangement for the transference of this business to the War Office has been completed?

The questions remained unanswered, the Speaker calling upon another member to put a question on a different matter.

The Naval Air Service—Mr. Balfour: Now let me say a little more upon some details of these preparations—not details in the sense we are accustomed to on Navy Estimates, but rather more detailed than any of the generalities which I have just given. Let me begin with the Air Service. The Air Service in the Navy entirely owes its origin to my right hon. friend (Colonel Churchill). Do not let us look back upon the past with all the fruits of our present experience, and say this is what clearly ought to have been done or ought not to have been done. It is enough for me to point out that, long before the use of aircraft had been proved by experience, my right hon. friend foresaw the important part it was going to play, and set himself to work to lay deep the foundations of a naval air service. Anyone who has had the opportunity which I have had of examining the work which has been done in this connection in the Admiralty is aware how much that service owes to the unremitting labour and unceasing personal attention which my right hon. friend gave to this particular branch of his duties. He was not content to leave it to others to do, and, indeed, I suspect that if in an old-established and traditional office like the Admiralty this question had been left entirely to what I may call the traditional routine of the office, the Air Service would have made nothing like the progress it did under the fostering care of my right hon. friend. But the growth which I have just indicated as regards the ships of the Navy has been at least as noticeable in regard to aircraft. Since August, 1914, I think I am not wrong in saying that the strength of the air forces of the Navy has grown tenfold. That necessarily involved some alteration of organisation; that which was suited to the infancy of this branch of the work becomes quite unsuitable when it reaches a certain expansion.

Although nothing essential has been changed, I think I may say without fear of contradiction that some modifications suited to the enormous growth of the service have been introduced with considerable advantage. Among other things, we found that the means of educating airmen was necessarily inadequate when you had to deal with a growth of such immense rapidity, and a growth which was taking place not merely in the Navy but in the Army. At one time the Navy and the Army more or less pooled their efforts in the matter of education. I need not trace the various modifications which have taken place on the original system. It is enough to say that with the sanction of the Treasury the Admiralty purchased, some months ago, a large tract of land very suitably situated—I will not say where it is—for purposes of training in flying, and that we have secured the services of Commodore Paine, who has done such admirable work in this connection for the Army. I do not doubt for a moment that under his supervision, and with all the facilities which, to the best of our ability, we are placing at his disposal, an immense growth in education in air matters will be the result of our efforts.

It has been said by many people, Why, after all, should the Navy have an air service at all? I do not mean to touch even remotely upon the vexed question of whether there should or should not be a separate Minister for the Air. I content myself with saying, what I think is indisputable, that whether there be a separate Minister for the Air or not, the Navy will always require a special service for its own purposes, however it be provided and whoever may superintend it. Its work is largely different from that of the Army. I do not deny that the Navy often does things which could be done by the Army, had the Army been at the moment provided with the necessary materials;

but undoubtedly the Navy must have its share in air work when the operations are partly or wholly naval.

The training of a naval airman is the same, indeed, as that of an Army airman in its early stages, but differentiates as time goes on. He has not to learn all the same things; he has to learn things which are perfectly useless to an Army airman during the ordinary course of his duties. No Army airman, for example, is required ever to use a seaplane. No Army airman need learn how to distinguish the various types of shipping, enemy and friendly, which have to be discriminated if he is to be a good scout over the sea. There are these and many other functions in which the training must be different for the two branches of the Service, and whether you put them ultimately under one Minister or not, that difference, in my opinion, never will be obliterated. If I have been fortunate enough to convince any sceptic that there must, therefore, be a separate air service under any circumstances, the next question is—have these services been so organised as entirely to prevent what is called overlapping?

It would be a very strong order to say that there never has been any overlapping in the work of the Army and the Navy, but I am absolutely convinced that, whatever may be true of the future, in the past it has been an immense gain that there have been two separate Departments dealing with all the nascent and early problems of this growing branch of warfare. It is all in its infancy. No one could tell you on March 5, 1916, what the developments will be on March 5, 1917. Nobody could have told you when war broke out in August, 1914, how in a year the type, the work, and the capabilities of the machine would have altered, and the very views we take on the whole Air Service would have suffered profound modification. I am quite certain that had the whole of this been left, for example, to the Army, immense developments in engine power and matters connected with the size and lifting power of the machines would have been undeveloped, not because the gentlemen connected with the Army Air Service were less competent than those connected with the Navy, but because the problem of dealing with heavy aeroplanes came before the Navy earlier and in a more insistent shape than it could come before the Army. The very fact that you have to use the seaplane, which must always be heavier than the lighter type of aeroplane, and the question of developing engine power, the question of developing economy of petrol, and the problems connected with the rapid improvement of the internal combustion engine for flying purposes have beyond doubt gained from the fact that the Navy threw themselves into this task from their own point of view and with their own objects, and to the immense advantage, in the end, both of the Navy and the Army. I need hardly say that this does not in any sense suggest that we ought not to establish such a committee as the Prime Minister has in fact appointed, by which the question of supply as between the two Services can be properly arranged. I am dealing with far deeper questions than that, and in a sense with far more interesting questions—the rapid development, in the face of an active enemy, of various types of flying machines which the Navy and the Army alike require.

There is one branch of the Air Service which the Army have deliberately handed over to the exclusive patronage of the Navy—I mean the lighter-than-air craft. Here, also, there has been a great development since the war began. As the Committee knows, it was decided—rightly or wrongly—in years gone by—I think myself wrongly, though I certainly do not blame the people who came to that decision—that it was not worth our while to deal with the complicated and costly question of Zeppelins. I do not believe that any prophet now living could say with confidence what the future relations between the Zeppelin and the heavier-than-air machines is going to be. Both are improving, and perhaps the improvement in the heavier-than-air machine is more rapid and more certain than the improvement of the Zeppelin.

It may conceivably be that ten years hence people will refer to the Zeppelin as an antiquated instrument, and say, "You ought to entirely rely upon increasing the magnitude and the power of your heavier-than-air machines." On that I make no prophecy, I venture no forecast. All I say is that at this moment it is extremely desirable that we should have lighter-than-air machines from the naval point of view in order to supplement the efforts of our Fleet by machines for scouting which, in many respects and in favourable weather, are far more effective than the swiftest destroyer, or the most powerful cruisers. Therefore we have done, and we are doing, our best to develop the lighter-than-air machine. The difficulty, to me rather an unexpected one—I am not talking of Zeppelins now but of non-rigid types—is not so much in constructing the instrument as in housing it. In the present condition of labour throughout the country the length of time taken to build an adequate shed and shelter for these instruments is what is really checking their use. We find it easier to provide these lighter-than-air craft than to lodge them suitably. The kite balloon, which also has been

handed over by the Army to the Admiralty, has undergone great and growing development. I do not know what the ultimate limits of its utility are, but I am persuaded that we shall find more and more use for it at sea, and that the extraordinary change which has gone on in the last twelve months in the use of the kite balloon is symptomatic of the value which it will have, not merely in land operations, but in sea operations also.

A Criticism about Air Defence—Colonel Churchill: There is another matter which I cannot avoid mentioning, although I shall do so in language of the utmost precaution. A strategic policy for the Navy, purely negative in character, by no means necessarily implies that the path of greatest prudence is being followed. I wish to place on record that the late Board would certainly not have been content with an attitude of pure passivity during the whole of the year 1916. There is one smaller and cognate matter which illustrates what I mean. We hear a great deal about air raids. A great remedy against Zeppelin raids is to destroy the Zeppelins in their sheds. (Loud cheers.) I cannot understand why all these many months, with resources far greater than those which Lord Fisher and I ever had at our disposal, it has not been found possible to carry on the policy of raiding which in the early days even carried a handful of naval pilots to Cologne, Düsseldorf, Friedrichshaven, and even to Cuxhaven itself.

"Too Much Made of Zeppelin Raids"—Admiral Sir H. Meux (Portsmouth, U.): As to aircraft, I think we are making a good deal too much of these Zeppelin raids. I can say that because we are all in the same danger. Even in this House we are not safe, although I don't suppose there is any truth in the German rumour that any German airman who destroys this House and the members in it will get penal servitude for life. (Laughter.) I do not agree with the First Lord who says he does not blame our rulers for not having Zeppelins. I do, but as that was before the war there is no use pursuing the subject, though they ought to have known the potential danger.

HOUSE OF LORDS

March 9. Lord Montagu of Beaulieu asked His Majesty's Government whether, in view of the great and growing importance of aviation in modern warfare both by sea and land, and the need for special attention and effort being concentrated upon it, they would create a separate Ministry to deal with the whole question. Everything must be subordinated to the needs of the war, and although he welcomed the appointment of the Committee over which Lord Derby was to preside, which was in itself an admission of weakness, he wished to convince the Government that there was need for something bigger with wider powers and with a man of imagination and foresight at its head. Everything said in either House of Parliament was known in Germany in a few days, and he could not therefore deal with the technical aspect of the subject. He was glad to see that Sir David Henderson had been appointed to the Army Council, and wondered if that was the result of his question having been placed on the paper.

With regard to the suggested Ministry of the Air, he admitted that only a year ago he was very doubtful whether the Air Service should not run on its present system divided into two branches. But it could not be denied that the present position of our Air Service was very unsatisfactory. A year ago, and even last summer, a German aeroplane was hardly ever seen over our lines in Flanders, but now he feared we had lost our air supremacy. It was our duty at all costs to regain it, and we should not regain it until our present system was altered. The Germans now had aeroplanes which could fly faster and ascend more quickly than ours. At home we had had about twenty-five visits from Zeppelins, and with the exception of part of a propeller found in Kent this week there was no evidence that any Zeppelin had been seriously damaged. But the Committee over which Lord Derby presided was merely one which allocated the production of our factories to the Army or the Navy. It was merely a departmental committee, and though other powers might be thrust upon it, it had been appointed merely for the purpose he had stated. He had seen no fresh arguments against the appointment of a Minister of Aviation. They were precisely the same arguments as those which had been urged against the appointment of a Minister of Munitions, and everyone knew what the effect of that appointment had been.

The first function of such a Board would be the function of supply and construction. The Derby Committee to-day, he believed, had to do with supply, not with construction. He would also like to see the Board of Aviation deal with the question of future policy; it should be able to inform the future staff what was the best kind of machines to construct for certain purposes. It should include a representative certainly of the Admiralty and of the War Office; men of commercial manufacturing experience, and also a member of the General Staff or a delegate from that staff. At the present moment this was a Parliamentary responsibility. If anything went wrong with the Air Service or Zeppelins came over and did harm to this country, who was the Minister responsible? He had never discovered any Minister who was particularly responsible. If questions were now asked about the air defence of London, it turned out that there had been four different stages in regard to its organisation.

He did not propose at this stage to ask the Government right away for a Ministry of Aviation. But he thought they ought to take the Derby Committee, give it more power, and make it the

germ of what might come later. The Chairman of that Committee should certainly be a member of the Cabinet or of the War Council. At the present time the Air Service was merely auxiliary to the fighting forces of the Navy and Army. He could see a time coming when the Air Service would be more important than either the Army or Navy. We must get into the habit of looking at the Air Service not as an auxiliary to the Army and Navy, but as a great service which was an establishment of itself and to which we should have to look in future years largely for the defence of this country. It would take many years before the full value of air-power was realised.

Then there was another aspect. All war would become more and more scientific, but warfare in the air would become more scientific than anything which had preceded it. There should be one responsibility, and one only. The three problems to be dealt with were simple enough, but they required all the brains at the disposal of the country to solve. They were, first, the provision of powerful enough aeroplanes; secondly, the provision of powerful enough anti-aircraft guns; and thirdly, the construction and building at once of airships of the Zeppelin type for this country. As regards the first point he thought it would be admitted as necessary. As regards the second, our anti-aircraft guns with few exceptions were of far too small a calibre and nothing like powerful enough to do serious damage to a Zeppelin. Any one who saw the raid of last September must have thought it tragic and pitiable that the shells fired at a Zeppelin flying 7,000 ft. high burst at the extreme range of about 5,000 ft. To do any real damage quite a big gun was needed. The modern Zeppelin consisted of about 20 balloonettes, and unless you could set it on fire or tear the envelope the airship, if struck, would probably get home and become a formidable adversary on a future occasion. There was at one time a great contempt in this country for Zeppelins and a conviction that they could always be overcome by aeroplanes. He had never subscribed to that view. For proper defence against aircraft you must have both kinds of aircraft, and to depend on aeroplanes to destroy Zeppelins was a great mistake.

Then we should do to our enemies what they had done to us. They attacked, and were going to attack still more, our manufacturing districts, while we had never attacked theirs to the same extent. Yet there were points on our frontier in Flanders which were far closer to Essen and the great industrial districts of Westphalia than our industrial districts were to the nearest for the German airships. We were absolutely unable to give a proper reply, which was the bombing and destruction of the hangars of the enemy beyond the horizon of his manufacturing districts. In order to convince their lordships of the seriousness of the modern Zeppelin, he would quote a few particulars. Every one, he supposed, would grant that the number of Zeppelins possessed by Germany was still considerable. Within the last few days he had talked with a neutral who had come from Berlin and who was in a position to know what he was talking about, and he had put the number as high as 50. He himself (Lord Montagu) thought it was between 30 and 40. There were a certain number on the Russian frontier, but there was a possibility of their putting a fleet of not less than 20 in the air at this moment. That was a formidable fleet when it was remembered that each Zeppelin could carry 1½ to 2 tons of explosives and thermite and oxide of aluminium for fire-raising purposes, materials under which steel melted like thin wax and which nothing could resist. The great danger in this country was not from explosives but from fire, and he would like the Government to consult fire experts, such as the London Fire Brigade and the fire brigades of our great cities, on that subject. If a thermite bomb were dropped on any of our big cities, one would not like to contemplate the loss of life that would ensue and the shock to our national nerves.

The length of the most recent form of Zeppelin was over 560 ft. and would shortly be over 600 ft.—or getting on towards three times the length of Westminster Hall. They were 65 ft. in diameter, and furnished with four engines and propellers. They had a radius, or would shortly have a radius, of 2,000 miles. The distance from Ghent to London was only 160 miles, to Sheerness only 120 miles, to Dover 110, and to Portsmouth 212, while our manufacturing districts as far west as the west of Staffordshire were not more than 250 miles. From Emden to Hull it was only 300 miles, to Newcastle 320, and to Manchester 350. To the Firth of Forth it was only 450 miles, to Cromarty Firth 530, and to Scapa Flow 550: so that if they considered the range of these airships they would have to extend their ideas considerably of the danger that might exist. He believed it was more serious than the aspect on land. If the German Fleet came out, and came out at a time that suited the Zeppelins, although their aid might not redress the balance against the superiority of our Fleet, it would cause extra losses, it would make the tactics of our Fleet more difficult, and might even have a serious influence on the battle itself.

THE DEFENCE OF ARTILLERY

Some people said we ought to try to defend this country to a large extent by artillery, and he was sorry to hear the Secretary for War say the other day that the building of certain anti-aircraft guns had been accelerated to the disadvantage of other guns in order to cope with this danger. They might just as well try to retain the supremacy of the sea by means of a few forts

along the coast as to cope with Zeppelins by setting up artillery all over the country, unless—as was unthinkable—they were going on the idea of having these guns round all the great centres. The extreme range with the guns we had—he would not give the figure—but he would say that Zeppelins could rise higher. They could fly to a height, he believed, of 15,000 ft., and any gunnery expert would tell them that accurate shooting at an object travelling at that height was a very difficult thing.

The airships that attacked us did not come over at their top speed, but at an economic speed—about 35 miles an hour—but when they were here, if they were fired at, they could go up to well over 70 miles an hour. To hit an object flying at 70 miles an hour when you did not know the wind at that height was beyond the science of gunnery. The only way to overcome Zeppelins was to carry the war into the enemy's camp, and for that they required powerful aeroplanes to bomb the enemy's territory and hangars. He was aware that there was a new air engine coming out in Germany of 225 horse-power, and an extraordinarily light plane which was likely to give extraordinary results. In this connection it would be worth while to take note of the fact that in France and Germany all the finest guns as well as the finest planes came out of private factories. He doubted very much the wisdom for any branch of military equipment of setting up Government manufactories except on a very small scale. It was on the big firms they must rely when the time of strain came. The French had more powerful planes than we had, and it was right to acknowledge the debt we owed them. We were copying many of their planes in our workshops, and they had been very generous in the way they had helped us.

There was no comfort in the phrase that "no damage had been done of military value." The truth was we had had stupendous luck up to now. He knew one case where a great munition works escaped by a few yards, and that in the raid of January 31 one of our most important machine-shops for making air-engines was only missed by a few yards also. That luck could not be expected in the future. Sooner or later not only large manufactories would be destroyed, but an immense damage done in the country. The subject was a very serious one. He had tried to say nothing which would help the enemy. He could tell of scandals which until a few days ago were still going on—of one which was worse than a scandal, for the man responsible for it ought to be hanged. Our shores were within easy reach of the enemy. We were unprepared to resist or to destroy any Zeppelins that came over in force. The advantages of our insularity were rapidly disappearing. Even those of meteorological conditions were diminishing. Upon the efficiency of the Air Service now and in the future much would depend; and if he would end on the note of grave warning he would say—Let it not be said with shame of our generation that we did not trouble to guard in the air what our forefathers won on the sea. (Cheers.)

Lord Oranmore and Browne: About three weeks ago he raised the question of Zeppelin raids, and suggested that the problem could only be solved by the creation of an Air Ministry. The real business of the war was conducted by the War Committee of the Cabinet. But he was not wedded to the idea that the Air Minister should necessarily be a member of the Cabinet, although it would be an advantage if he were. Lord Derby, who had been appointed chairman of a committee which, so far as he could make out, was intended to co-ordinate, if possible, the use of men and material between the Army and the Navy, disclaimed that he had anything to do with the defence of the United Kingdom against aircraft. The great disadvantage of leaving the control of the Air Service in the hands of the Army and Navy was that they would be more concerned with the particular needs of their own services, and would fail to look at the matter from a broader point of view.

Viscount Haldane said he was in entire agreement with the two noble lords, but the question was not what we desired but how we were to get it done. Lord Montagu had worked out this subject with great devotion, and he could testify to the assistance which Lord Montagu had rendered to him when he was charged with the responsible duty of laying the foundation of the Air Service. Yet in the two speeches to which the House had listened there appeared to be a note of uncertainty. A Minister of the Air was suggested, another Minister to be added to the already very large Cabinet. One noble lord had remarked reflectively that the Cabinet was already so large that it would not matter if another Minister was added. But what was the new Minister to administer? The noble lord had suggested that he might look after the *personnel* not only of the defence of London, but of the whole Air Service. He wondered how Admiral Jellicoe would like to have under him in the North Sea airmen over whom he had no command. He had had a good deal to do with the early question of aircraft, and in order to get at first principles the National Physical Laboratory had been taken for Lord Rayleigh's Committee to work out what was required, and experimental practical work had been carried on under the direction of Mr. O'Gorman. The result of that work had been that, although somehow this country had not taken a real interest in the Air Service such as that taken in France and Germany, we had very early in the war established our supremacy in the air. Now we were far behind, but not in construction and not in design. The Germans might have constructed a new engine, but he believed the Fokker engine was an adaptation of a French

engine. He did not know how we stood at present with regard to our aeroplane service, but he doubted very much if we were behind the enemy more than momentarily. It was our own fault if we were behind, for we had certainly got the men who could put us in front.

When he came to speak of Zeppelins he had a different tale to tell. The Zeppelin was an invention of the enemy in which we were lamentably behind. But in those early days the Zeppelin did not receive the same attention that it did now. The Government permitted no construction which had not included any experience of the making of these great airships. He did not know, but he doubted, whether Lord Rayleigh's Committee was consulted very much as to the physical conditions to which a Zeppelin was subjected. The only real Zeppelin that he knew of that was constructed here met with an accident, and went to pieces immediately. The Admiralty seemed to have been discouraged and not to have proceeded further. Speaking for himself, he thought we missed a great opportunity of applying to the construction of Zeppelins the same amount of science that we endeavoured to apply to the construction of aeroplanes. He believed that if the same course had been taken we should be much further advanced than we were to-day. As it was the progress had been very uneven. The heavier-than-air machine had progressed well, while the lighter-than-air machine had not progressed, and it was owing to our not having worked out the same principles in the same clear way, and our not having had the same special expert education with regard to their construction.

Its bearing on the problem they had to-day was that we had got to make up the lost ground. A Minister of Air was all very well. Some day or other the Air Service might have grown to such an extent that we might need one. At the present time what they had to be sure of was that the same amount of science was being devoted to the construction of the Zeppelin as was devoted to the construction of the aeroplane. He would be sorry to see the control of the direction of the Army Air Service in any way removed from General Henderson.

The question before the House was not a question of making some energetic person Minister of the Air and saying, "Now produce something." If he were appointed then in a very short time the silken rope to which allusion had been made would be about his neck. He agreed that in the future the war in the air was likely to play a much greater part than it did at present; how great, it was useless to prophesy. All we knew was that we were far behind in the matter of scouting; and we were materially hampered in not having a fleet of Zeppelins. But we should not make matters better if we snatched things out of hands in which they were and put them in the hands of somebody who had probably had less experience than those who were handling them now. What they had to do was to strengthen the scientific foundation on which the service rested at the present time, and to make sure that no action was undertaken which did not rest upon a basis of carefully considered action.

Lord Beresford said he entirely agreed that the new air warfare was going to be perhaps of so tremendous a character that it might supersede the Army and Navy. Anyway, we should be ahead in the air the same as we were on the water. Zeppelins were a very great danger. If they dropped explosive bombs which contained explosive liquid the fire could not be put out except with sand. Therefore once they dropped them over magazines or arsenals the danger would be extremely great. He proposed that Zeppelins should be built as soon as ever it was possible, for the simple reason that in all war machines you must meet like with like. And Zeppelins must be met with Zeppelins. The reason why we did not raid enemy places as we did at the beginning of the war was that the machines we bought were bad machines and had not got air endurance. If we had taken English artisans and had machines of English manufacture we should have been a great deal more advanced. We had lost several of the finest young men in the world by sending them up in bad machines. It was murder to send men up in this way, and the money we had spent uselessly was fabulous. With regard to the suggestion for an Air Minister, he did not think it would help the case, and he did not agree with Lord Montagu in having only one air service.

THE GOVERNMENT REPLY

The Marquess of Lansdowne: The subject is one which my noble friend has made his own, and he has a right to claim that he made it his own long before it attracted the amount of public attention which it now commands.

No one, I think, will deny that there have been very serious shortcomings in connection with the air service of this country and that it is our duty to devote all our energies to correct the defects which have arisen, and I would only ask people to remember that this science is still in its infancy. It is undergoing the most extraordinary and rapid developments. Just as there have been new developments in trench and submarine warfare, so there have been rapid developments in aerial warfare, and accordingly it is impossible to say that the Army or Navy should at any given moment have been supplied with standardised equipment of any particular kind or class of weapon. Nor must it be forgotten that in the case of equipment for aerial warfare we have to contend with the great difficulties due to the stupendous and wholly unexpected efforts which this country has been called upon to make.

The improvement in the quality of our military equipment has been very remarkable indeed. In the first place, as far as warfare at the front is concerned, we have certainly not been out-classed by our opponents. I say that in regard to the quality of our equipment. In regard to quantity, I am told that, taking first the number of machines, the output per month is at the present moment twenty times that of peace, and this will more than double itself during the summer, and that in spite of the fact that there have been a large percentage of casualties, which I am glad to say have all been replaced. With regard to aeroplanes, the output per week is about three-quarters of that for the whole of the year ended August, 1914. All the original types of aeroplanes which accompanied the Expeditionary Force in August, 1914, have now been replaced by something better, and this progress continues. With regard to the number of units I am told that by the end of the month the number of squadrons abroad will be eight times those which accompanied the Expeditionary Force in August, 1914.

With regard to air raids on this country, so far as our experience has gone, I should be inclined to say that what people have resented most is not so much the extent of the damage that has been done by these raids as the impunity with which they have been carried out.

I say that without any idea of suggesting that we desire to ignore the warning with which my noble friend concluded his speech. On the contrary, we do fully realise that this danger of invasion by aircraft is a very real danger, that it is one that might at any moment threaten the bases of our armies abroad, and that it is our duty to take every possible precaution to meet it. There is no idea of suggesting that inferior guns or less trained gunners should be employed on this service. On the contrary, it is intended that the best guns and the best men shall be appointed, and that the air service shall be regarded as interchangeable with service at the front. The main complaint made is that the air service is wanting in organisation, that there has been a dispersal of effort, a scramble between the two services, and the absence of a comprehensive and directing policy. As to policy, I am not quite sure that I know what is in our critics' mind. I think I do know what is in their minds when they talk of military policy or naval policy, although I shall always maintain that the two form part of a single policy for the defence of the country, and, for the matter of that, for the defence of the Empire—a single policy directed by a single controlling Government. I find it as difficult to think of a separate air policy as of a separate military policy or a separate naval policy, because, unless I am greatly mistaken, the air service must be to a great extent auxiliary to the Army and Navy. The Navy will always insist upon having an air service of its own, and a like claim will be put forward by the Army. The proper way of looking at the question is to recognise the Air Service as a most important ally to the other two Services, to put it alongside of them, and to see that if there is a tripartite policy it is really directed from one controlling source and in accordance with the general needs of the country and the Empire.

We are asked, what have we been doing. We have appointed the Joint Air Committee. On the committee there are three distinguished officers representing the Admiralty, two representing the War Office, and as it may summon to its assistance ad-

visory members, there is an opening for calling in that special scientific knowledge upon which Lord Haldane so properly insisted. One of the committee, Sir David Henderson, has just been appointed a member of the Army Council; and the committee is to have for its secretary and assistant secretary the secretaries of the Committee of Imperial Defence, whose knowledge and experience will be of great value. The committee is to have a free hand to deal with questions of design, production, and distribution. To sum up the functions of the Derby Committee, its business will be to ensure that the manufacture of supplies and the distribution of material shall be in accordance with the policy of aerial warfare laid down by the Government. It is said that the recent speech of Lord Derby in this House showed that the scope of his functions was necessarily limited. I think Lord Derby's language has been rather unfairly interpreted. I heard Lord Derby's speech. I admit it might have left an impression on some minds that Lord Derby was desiring to minimise the importance of his own committee. What I think Lord Derby really wanted to explain was that he had no executive functions, and that for that reason he was not to be held in any way responsible for the air defence of London or the United Kingdom. That is perfectly true, but, while not having any executive functions, with that reservation, the position of Lord Derby and his committee is extremely powerful, and there is no portion of the field of inquiry from which he and his colleagues are excluded.

I may be asked why having gone so far we do not pluck up a little more courage and appoint a minister with a full-blown department subordinate to him. We shall not be deterred from making an arrangement of that kind because it would add one more to a somewhat numerous Cabinet. But it does not seem to me that such an arrangement would give any advantage beyond that derived from the present arrangement. Although I have readily admitted there are imperfections to be removed, it has never been established to my satisfaction that the only way to remove them is to appoint a Cabinet Minister to deal with them. What really matters is the essence of the arrangement, not the particular style or title you give. A great many of the mistakes are the mistakes of subordinates which would have been committed even with a Cabinet Minister at the head of the department. As the matter stands we have a very strong committee with a strong man at the head, and we have given them access to every source of information and to every branch of the subject of aerial warfare. We have given them liberal instructions, which we trust will be interpreted in a liberal sense. That is a business-like arrangement, which is a great advance on anything we have had. It promises well, but I am not here to say that in our opinion there should be any finality about this arrangement or that we exclude altogether the possibility of further development. Experience will show whether the present arrangement will work and what further changes are desirable. Meanwhile I am not prepared to admit the country is undergoing any detriment because we have stopped at this point. The committee is doing its work well, and we may trust it to take advantage of the wide latitude which has been given to it. I trust the committee will not disregard the emphatic warning which the noble lord has given to it and to the country.

AIRCRAFT IN ACTION

OFFICIAL INFORMATION

ENGLAND

March 6—Zeppelin Raid on Eight Counties—War Office announcement: "The number of Zeppelins which took part in last night's raid (March 5) is now believed to have been three. After crossing the coast, the airships took various courses, and, from the devious nature of their flight, were apparently uncertain as to their bearing. The area visited included Yorkshire, Lincolnshire, Rutland, Huntingdon, Cambridgeshire, Norfolk, Essex, and Kent. As far as is known about 40 bombs were dropped altogether. The casualties so far ascertained amount to:

Killed	Injured
3 men	33
4 women	
5 children	

The material damage was: Two terraces of houses practically destroyed, one office, one public-house, a café, and several shops partly destroyed, and a block of almshouses badly damaged."—(See German Official.)

March 7—Further Details of Zeppelin Raid—War Office announcement: "It has now been ascertained that at least 90 bombs were dropped by the enemy airships during the raid of the 5th-6th March. Bombs appear to have been dropped indiscriminately over rural districts. This may be due to the fact that, owing to the rough weather, the Zeppelins were uncertain as to their whereabouts, and were anxious to get rid of their bombs before escaping under cover of night. No military damage of any description was caused. The casualties were entirely confined to the civil population, and of those previously reported as injured one has since died in a village in Lincolnshire, bringing the total killed to 13."

March 8—Zeppelin Raid—War Office announcement: "In addition to the casualties already announced, five persons previously reported as injured in the recent air raid have died, and fuller particulars of the

number of persons injured are now available. The total casualties (all areas) are as follows:

Men	Women	Children	Total
9	4	5	18
Injured			
22	22	8	52
—	—	—	—
31	26	13	70

March 10—Thirty-one Machines in Action—Yesterday (March 9) we carried out a successful aircraft attack against the hostile railhead and billets at Carvin. It is believed that considerable damage was done. Thirty-one machines took part in the raid and all returned safe. As the result of a fight in the air a hostile machine and one of our own machines were brought down near Tournai. Carvin is a manufacturing town of 22,000 inhabitants about seven miles north-east of Lens.

March 10—Non-Combatants Killed in Air Raids—The Prime Minister, in a written answer to Major Sir Charles Hunter, who asked the number of non-combatants who have been killed or drowned by the enemy, gives the following figures:

	Men	Women	Children	Total
In air raids	127	92	57	276

March 13—Seaplane off Kent Coast—A German seaplane was sighted off North Foreland shortly after noon yesterday (March 12).

FRANCE

March 7—German Aeroplane Brought Down—"In the Argonne, in the region of Avricourt, our special guns brought down a German aeroplane, which fell in our lines. Both aviators, who were wounded, were taken prisoners."

March 8—Raid on Metz—"Aeroplane bombardment squadrons consisting of 16 machines dropped 124 bombs of every calibre on the

station of Metz-Sablons, where there were several trains. The projectiles found their mark. A squadron of enemy aeroplanes attempted to pursue our machines, which returned to their starting-point with the exception of one aeroplane, which was compelled to land as the result of engine trouble."—(See German official.)

March 10—Battles in the Air—On March 8 our aircraft displayed particular activity. Numerous actions were fought by our machines mostly over the enemy's lines. During these aerial encounters 15 German aeroplanes were put to flight. Ten were seen to plunge vertically into their own lines, and, according to definite information, two German machines, one of which was a Fokker, were brought down in Champagne and three in the region of Verdun. These machines fell into the German zone.

March 11—Fokker Brought Down—To-day (March 11) in the region of Douaumont one of our aeroplanes brought down a Fokker, which fell in flames in the German lines.

March 11—Denial of German Air Victories—The French newspapers reply to a lie in the German Press on the subject of the losses of the French aviation corps during the month of February. The French only lost six aeroplanes, four of which fell into the enemy's lines owing to simple accidents to their engines, while two came down after fighting. On the other hand, the French have occasioned the loss of 11 German aeroplanes, six of which were brought down in the French lines and five in the German lines.

March 10—Schedule of Allies' Air Losses—Our battle-aviators shot down two English aeroplanes: namely, one monoplane near Wyttschaete (to the south of Ypres), and one biplane to the north-east of La Bassée. The occupant of the first machine is dead. In the month of February the activity of our air-units as regards attacks and the number of their far-reaching reconnoitring and nocturnal squadron expeditions behind the enemy front were considerably greater than ever before. The following schedule not only again proves our superiority, but also refutes the assertion so beloved by our opponents, that our losses in aerial warfare are so small because our aeroplanes do not dare to fly over the enemy lines. The German losses on the western front during the month of February amount to: None in aerial battles, none by being shot from the ground, six missing. Total, six. The French and English have lost: Thirteen in aerial battles, five by being shot from the earth, three by forced landings within our lines. A total of 21. With regard to this, it must be observed that we have based our figures only on the machines which have fallen into our hands, or which have been observed to fall down in flames, and not the numerous other machines of the opponents shot down behind the enemy lines. According to the February official reports, nine German aeroplanes were brought down by the Allies and 10 others were forced to descend in their own lines, some of them probably badly damaged, if not destroyed.

March 11—French Aeroplane Brought Down—A French aeroplane hit by our anti-aircraft guns fell in a burning condition south-west of



Copyright Photo]

ERECTING STAFF OF BLERIOT AERONAUTICS

[R. N. Stephenson

March 12—Two Enemy Machines Brought Down—"This morning (March 12) Sub-Lieutenant Guynemer brought down a German aeroplane, which fell in flames in our lines near Thiescourt. This is the eighth aeroplane brought down by this pilot. Six of these fell in our lines and two in the German lines. Another of our aviators also brought down an enemy aeroplane in our lines near Dombasle, in the Argonne. The passengers of the two machines thus destroyed were killed. The same day our squadrons of fighting aeroplanes fought 18 actions in the air in the region of Etain, putting their adversaries to flight."

DARDANELLES

March 8—Turkish Aerial Activity—Turkish official: "Demonstrations by enemy war vessels, assisted by aeroplanes, against the coasts of the Dardanelles were rendered ineffective by our artillery. Two enemy cruisers were hit. The activity of our aviators has prevented the enemy from effecting reconnaissances in the Dardanelles."

GERMANY

March 6—Raid on Hull-upon-Humber—"During the night of March 5-6 some of our naval airships raided the naval point d'appui of Hull-upon-Humber and the docks, dropping a great many bombs. Their success was ascertained. The airships were violently fired upon, but in vain, and all returned."—(See English official.)

March 7—Airships Bombard Bar-le-Duc—"One of our airships heavily bombarded during the night (March 6-7) the railway establishments of Bar-le-Duc."

March 8—Bombs on Troops—"Our air squadrons bombarded the villages west of Verdun, where troops are concentrated."

March 9—Three Enemy Machines Shot Down—"In a series of aerial engagements in the neighbourhood of Verdun our aviators remained victors. It is certain that three enemy aeroplanes have been shot down. All our aeroplanes returned safely, but several of their brave pilots were wounded. The enemy troops in the villages to the west and south of Verdun were heavily bombarded. By an attack delivered by a French aeroplane squadron within the radius of the fortress of Metz two civilians were killed and several private houses damaged. In an aerial battle the machine of the commander of the squadron was shot down. He was taken prisoner. His observer was dead."—(See French official.)

Château-Salins, between our lines and those of the enemy. The occupants, who were dead, were secured by us, together with the débris of the aeroplane.

March 11—Bombs on Russian Warships—On Thursday morning (March 9) a Russian naval unit consisting of one ship of the line, five destroyers, and several freight steamers was attacked in the Black Sea off Kaliakra (on the Roumanian coast, north-east of Varna) by German naval aeroplanes and bombarded. Hits were observed on the destroyers. In spite of the fierce bombardment by the Russians all the aeroplanes returned.

FROM OTHER SOURCES

ENGLAND

March 8—Aircraft Hit in Kent—It is stated by the Exchange Telegraph Company that a broken portion of one of the propellers of a Zeppelin that visited Kent was picked up yesterday and handed over to the military authorities. The discovery was made in the morning by a man proceeding to his work, who had his attention attracted to something of an unusual appearance protruding from the ground. He reported the matter to the proper authorities, with the result that a portion of a propeller, containing three blades, was excavated. It was so deeply embedded in the earth as to suggest that it must have fallen from a considerable height. Examination of the blades corroborates the view that the propeller must have come from a Zeppelin, which is thought to have been struck by gunfire. The find was made at a spot over which the Zeppelin was seen to pass early on Monday morning.

March 9—Zeppelin Raid on Munition Train—A Zeppelin tried on Tuesday night (March 7) to repeat the attempt which ended so disastrously a fortnight ago to bombard Révigny Station. According to accounts given by refugees from the Verdun district, a Zeppelin flew over Révigny at about 1 o'clock in the morning and from a height of little more than 1,000 yards dropped several bombs, none of which did any damage. During the bombardment the stationmaster, with great presence of mind and coolness, succeeded in shunting a train of munitions, which was in the station at the time, to a place of safety. The stationmaster and two other officials have been decorated with the Croix de Guerre in recognition of their act.

March 9—French Aviators' Raid—Six French aviators bombarded on Monday and Tuesday (March 6 and 7) railway lines running to the front and various German stores in Belgium, causing much damage. All the aviators safely returned to the French lines.

March 11—Reported Destruction of Zeppelin—The *Journal des Débats* has received a letter from Brussels, dated February 2, reporting that a Zeppelin had just been destroyed at Mainvault, near Ath, on the line from Brussels to Tournai. The airship is a complete wreck, and all the crew were killed. The Zeppelin in falling killed some and injured other persons. The destruction of the airship was at first attributed to gunfire from the Paris air defences, but this is said now not to have been the case.

(This report has since been confirmed by other eye-witnesses of the disaster. The accident occurred at dawn. The airship was apparently the one which dropped bombs on Paris during the night.)

FRANCE

March 3—Aviator Killed—At Ambérieux a pupil named Delaunay made a mistake and collided with a tree, where his machine was smashed. The pilot was killed.

March 8—Lieutenant Killed—This afternoon Lieutenant Aviator Merlot, of the military aerodrome at Chartres, was flying at a height of 500 metres and some four kilometres from the aerodrome, when the machine caught fire and crashed on to the roof of a farm at Archevilliers. The pilot was killed.

ITALY

March 5—The Italian Raid on Lubiana—The Austrian official report confirms the statement that there were 800 victims of the Italian air raid on Lubiana (Laibach). The Austrian Government have given orders for this report to be kept secret, more especially as two officers of the General Staff are among the wounded. The Italian aviator, who was made prisoner, succeeded in bringing down an aviatik. (The raid on Laibach took place on February 18 and was reported in our issue of February 23.)

MESOPOTAMIA

March 6—British Aerial Reconnaissance—British aeroplanes have made excursions in all directions, and a seaplane which flew over Bia Saba could discover not the slightest sign of any movement of troops in Palestine. Another report states that the Egyptian frontier in the direction of Lybia is also quiet. An aeroplane which flew along the coast and went as far as the oasis of Shwva returned to Daboa with the news that no hostile army was anywhere in sight. The entire zone over which the British aviator had flown was clear of the enemy troops, both east and west. The Egyptian frontier is thus free from any imminent attack, and future defence becomes much simplified.

GERMANY

March 6—A Lost Zeppelin—It will be remembered that the destruction of a Zeppelin last month at Révigny was announced by the Germans in the briefest possible terms. The following advertisement now appears in a Dresden paper: "In deepest sorrow I announce that on February 21, in loyal fulfilment of his duty, and in his 37th year, my dear husband, the chemist Senior Lieutenant Hans Papperitz, second in command of a Zeppelin airship, holder of the Iron Cross of the First and Second Classes and Knight of the Second Class of the Order of Albrecht with Swords, found the hero's death for his dear Fatherland."

March 7—Zeppelin Flying West—Yesterday afternoon (March 6) a Zeppelin was seen at Maastricht going from the east in a westerly direction.

March 7—Activity in Belfort—The suspicion that after further progress against Verdun is hopeless the Germans may attempt a new diversion against Belfort has been confirmed by news from the Swiss border, where numerous reconnoitring flights by German aeroplanes over the Belfort territory have been observed within the last week. These aeroplane flights are periodical warnings of contemplated German offensives. They invariably precede some attack, and, judged from this peculiarity, the presence of swarms of aeroplanes over Belfort might be ominous. French aviation squadrons have, however, also been scouring the air, and have frequently cut short the German incursions, compelling their enemies to beat a hasty retreat. The inhabitants of Belfort last Thursday witnessed a thrilling aerial fight over their city, which ended in the discomfiture of the Germans. The object of the enemy evidently was to be informed of the movements of the French reserves near Belfort, and, according to German reports, the enemy fears a big French offensive against Alsace.—[The information contained in the above message to the *Daily Telegraph* bears signs of being perfectly correct.—Ed.]

March 8—Zeppelins with the German Fleet—A telegram from Ymuiden states that late last night (March 7) a steam trawler entering the port reported having sighted off Terschelling on Monday afternoon (March 6) a fleet consisting of at least 50 large German warships, followed by a large fleet of armed trawlers painted grey, two big Zeppelins, and numerous submarines, all proceeding westwards. Other fishing boats arriving at Ymuiden to-day (March 8) also report various movements of German warships in the North Sea. The latest story is that during the last Zeppelin raid on England an attempt was made by three armoured cruisers, accompanied by destroyers and submarines, to carry out a raid on the British coast. It is stated that a Zeppelin was in attendance, and carried out reconnaissances ahead of the squadron, which resulted in its reporting British precautions, making it necessary for the warships to give up the project and turn tail.

March 10—Airships Flying in an Easterly Direction—The *Tidens Tegn* reports that the Norwegian steamer "Bergen" met on Thursday (March 9) in the south of the North Sea a German fleet. One squadron was going easterly, in the same direction as two airships.

PROGRESS AT THE FLYING SCHOOLS

The London and Provincial School—Instructors: W. T. Warren, M. G. Smiles, H. Sykes, C. M. Jacques, and W. T. Warren, jun. Pupils doing rolling: Archer and Pulford. Pupil doing straights: W. L. Hay. Pupil doing circuits and eights: C. M. Clement. Owing to most unfavourable weather very little school work has been done this week.

The Grahame-White Civilian School—Straights with instructor: Baragar, Hillaby, Holman, Hathaway, Kryn, Leigh, Nadin, Rigby, Sloden, Sandys, Spencer, Walk and Williams. Circuits: Eichelbrenner, Grasset and Leigh. Instructors during week: Biard, Hale, Manton, Pashley, Russell and Winter.

The Hall School—The following pupils were out receiving instruction during the past week:—With C. M. Hill: Warswick, Osmond, Lieut. Cooke, Taylor, Rand, Smith. With J. Drew: Lieut. Cooke, Ormerod, Wooley, Arnsby. With A. Chave: Mahoney, Halliday, Gudger, Taylor, Collier, Rayne. The following pupils were doing rolling practice: Smith (2), Rochford, Neal, Roberts, Millburn. Machines in use: Hall and Caudron Government type tractors.

ERRATUM—We regret that through an oversight we omitted to record last week that a brevet was taken on February 27 by A. J. Mansel-Howe at the Grahame-White Civilian School.

CASUALTIES

ROYAL NAVAL AIR SERVICE

KILLED

March 6

Crocker, Flight Commander William R. (Lieut. R.N.).

Flight Commander William R. Crocker, R.N. (killed on service), had seniority as lieutenant in the Royal Navy of April 1, 1908, and as flight commander of July 1, 1914. Commander Crocker held the Royal Humane Society's Testimonial on Vellum for heroism—when sub-lieutenant of the *Highflyer* in 1907 he plunged into Bombay Harbour and saved a man who had fallen from the ship, the rescue being attended with great risk in a strong tide and with approaching darkness. Commander Crocker was most popular in the R.N.A.S. and rendered great services, especially as navigating instructor to both the aviation and airship branches.

ROYAL FLYING CORPS

KILLED

February 29

Stileman, Second Lieut. C. H., R. Fusiliers and R.F.C.

March 6

Johnston, Second Lieut. H. A., R.F.C.

Mesopotamia

KILLED

Undated

Peck, Second Lieut. R. H., R.F.C.

DIED OF WOUNDS

March 1

Wells, 10802 Second Class Air Mech. T. F., R.F.C.

WOUNDED

February 29

Bloomfield, Second Lieut. W. S. R., R.F.C.

Mills, Second Lieut. G. C., R.F.C.

March 4

Pierpoint, Second Lieut. R. A., Royal Berkshire Regt. and R.F.C.

March 11

KILLED

Capt. George C. N. Nicholson, R.F.C.

Capt. George Crosnield Norris Nicholson, of the R.F.C., only son of Sir Charles Nicholson, Bart., M.P., was killed on Saturday (March 11) while flying in England after several months' service at the front. Capt. Nicholson, who was born in November, 1884, was educated at Eton and Clare College, Cambridge. In 1907 he was appointed assistant private secretary to Mr. E. Robertson, Parliamentary Secretary to the Admiralty, and in the following year went to the War Office as private secretary to Col. Seely, then Under-Secretary for War. He became principal private secretary to Col. Seely on his appointment as Secretary for War in 1912. His death is a serious loss, not only to the Royal Flying Corps, but to the whole future of flying in England. Initiated early into public life, Capt. Nicholson had already been a candidate for the House of Commons, and was regarded as one of the men who would have done most after the war to develop and explain the new service. He took up flying at the outbreak of war, rapidly became a proficient pilot, and had done much to inspire his political and official friends with his own enthusiasm.

March 6

Godwin, Second Lieut. C. C., R.F.C.
Seedhouse, Second Lieut. C. N., General List and R.F.C.

Undated

Burrell, Lieut. C.I., R.E., 1st (The Newcastle) Northumbrian Field Co. (T.F.) and R.F.C.
Dickinson, Lieut. A. H., Northern Cyclist Bn. (T.F.) and R.F.C.
James, Second Lieut. C. E. H., Welsh Regt. and R.F.C.

UNOFFICIALLY REPORTED KILLED

February 29

O'Brien, Second Lieut. T. D., 16th Lancers, attached R.F.C.
Second Lieut. Terence Donough O'Brien, 16th Lancers, attached R.F.C., who was killed in Flanders on March 3, was the only son of Brigadier-General E. D. J. O'Brien, C.B., late 14th Hussars, Commanding the Western Mounted Brigade, and Mrs O'Brien, The Rectory, Buxted, Sussex. He was 20 years old on February 28, and received his appointment in August 1914.

March 1

MISSING

Champion, Second Lieut. H. F., 6th Rifle Brigade, attached R.F.C.
Newbold, Second Lieut. L. A., Essex Regt. and R.F.C.

PREVIOUSLY UNOFFICIALLY REPORTED KILLED, NOW OFFICIALLY REPORTED DIED AS PRISONER

Braddyll, Lieut. E. C., 10th Lancers, attached R.F.C.

March 4

UNOFFICIALLY REPORTED KILLED

Johnston, Second Lieut. H. A., R.F.C.
Second Lieut. H. A. Johnston, R.F.C., killed in France on March 4, was the son of Dr. Johnston, of Stranorlar, County Donegal. He was on leave for the day with a brother officer when a shell fell 10 yards away, killing him and wounding his companion. Aged 24, Lieut. Johnston was formerly with the firm of Siemens as wireless installation expert. He volunteered at the outbreak of the war, and served 12 months in the ranks before getting a commission.

March 3

MISSING

Birdwood, Lieut. H. F. London Regt. (T.F.), 20th Bn. (Blackheath and Woolwich), attached R.F.C.
Palmer, Lieut. C. W., R.F.C.
Lieut. Insall, V.C., R.F.C.
It is stated that the above officer is in hospital at Cologne. He was reported missing on December 15 last.

KILLED WHILE PASSENGER WITH HIS SON

A young Army aviator, Second Lieutenant R. Kilpatrick Muir, took his father, Mr. William Muir, of 38, Arden Road, Church End, Finchley, for a flight yesterday afternoon (March 12). When a few yards from the ground a sudden gust of wind caused the machine to lose its balance and it fell to the ground. The airman's father was thrown out and killed instantly, but the airman received only slight injuries, which were attended to at the nearest hospital. The machine was smashed to pieces.

APPOINTMENTS

The *London Gazette* of March 6 announces that Major-General Sir David Henderson, K.C.B., D.S.O., has been appointed a member of H.M. Army Council.

ROYAL NAVAL AIR SERVICE

Surgeon:

E. L. Markham, M.B., to *President*, additional, for R.N.A.S.: March 4.

Probationary Flight Sub-Lieut. (temporary), with seniority of February 22, and appointed to "President," for R.N.A.S.:
L. A. Powell.

The following have been granted temporary commissions as Lieuts. (R.N.V.R.), with seniority of March 4, and all appointed to "President," additional, for R.N.A.S.:

E. P. Currall, W. R. Parsonage, J. W. Sharpus, E. H. Cockshott, and J. Honey.

Wing Commander:

Squadron Commander Harold L. Woodcock: February 29.

With reference to the notice which appeared in the *Gazette* of February 11, 1916, relative to the confirmation in the rank of Flight Sub-Lieut. of George K. Blandy, this officer's first Christian name is "Geoffrey," and not "George," as therein stated.

Probationary Flight Sub-Lieuts. for temporary service confirmed in the rank of Flight Sub-Lieutenants for temporary service:

Cecil R. Blagrove: May 2, 1915.

John Archer Sadler, Alfred Gammon, and Willoughby A. Davies: July 11, 1915.

Frederick D. Till: July 22, 1915.

Charles L. E. Geach: July 28, 1915.

John C. Beddard: August 7, 1915.

Herbert C. Irwin: August 13, 1915.

Henry G. Holden: August 16, 1915.

Philip S. J. Owen: August 17, 1915.

Ian Macdonald: August 23, 1915.

Hector V. German: August 26, 1915.

Allan S. Todd: September 6, 1915.

Edward R. Grange: September 22, 1915.

Leonard Barr: September 25, 1915.

William P. Nicholls: September 28, 1915.

Gerald E. Hervey: September 30, 1915.

Harold Tether: October 31, 1915.

Herbert G. Leslie and Douglas A. H. Nelles: November 3, 1915.

Alexander M. Shook: November 5, 1915.

Alfred M. Hughes: November 7, 1915.

Hugh R. Aird and George S. Abbott: November 8, 1915.

Garnet N. Hughes: November 14, 1915.

Andrew J. Boddy: November 15, 1915.

Sidney J. Woolley, George L. Hartgill, Donald E. Harkness, and John H. Woolner: November 22, 1915.

Frederick S. Cotton and John O. Galpin: November 26, 1915.

Acting Lieut.-Commander:

Lieut. (R.N.V.R.) R. Leyland: March 4.

Lieuts.:

Sub-Lieuts. (temporary) Lord Loughborough, H. A. R. Norton, D. A. B. Tonks, and J. Morrissey: March 4.

Probationary Flight Sub-Lieut. (temporary), and appointed to "President," additional, for R.N.A.S.:

S. T. Hosken: March 8.

Lieut. (R.N.R.):

T. Godman, to *President*, additional, for R.N.A.S.: March 8.

Temporary Lieuts. (R.N.R.):

J. H. English, J. N. Wilson, H. A. H. Seabrook and E. L. Johnston (both acting), all to *President*, additional, for R.N.A.S.: March 8.

Sub-Lieuts. (R.N.R.):

W. H. Watt (acting), F. Cleary and F. Richardson (both temporary), all to *President*, additional, for R.N.A.S.: March 8.

ROYAL FLYING CORPS

Wing Adjutants:

Lieut. Dawyck M. V. Veitch, 1st Duke of York's Own Lancers (Skinner's Horse), Indian Army, vice temporary Capt. C. F. Lee, W. Somerset Yeomanry, T.F.: from December 20, 1915, to February 24, 1916.

Capt. Gerald J. L. Stoney, Worcestershire Regt., and to be seconded, vice Lieut. D. M. V. Veitch, 1st Duke of York's Own Lancers (Skinner's Horse), Indian Army: February 25.

Flight Commanders from Flying Officers:

Major Robert A. Bradley, Prince of Wales's (N. Staffordshire Regt.) and Capt. Stephen C. W. Smith, E. Surrey Regt., Special Reserve: February 20.

Flight Commander:

Capt. F. M. Roxby, Prince of Wales's (N. Staffordshire Regt.), Special Reserve, from a Balloon Officer: February 20.

To be Temporary Maj.:

Second Lieut. G. I. Taylor, R.F.C., Special Reserve, whilst performing duties of Professor of Meteorology: February 14.

Flying Officers:

Temporary Lieut. W. Astell, Lovat's Scouts, Yeomanry, T.F.; Sec. Lieut. D. S. C. Macaskie, Special Reserve; Sec. Lieut. William O. Russell, Special Reserve: February 22.

Sec. Lieut. John J. Breen, R. Irish Regt., and to be seconded; Sec. Lieut. John B. F. Austin, 3rd (King's Own) Hussars, and to be seconded: February 23.

Second Lieut. Patrick C. Campbell, Princess Louise's (Argyll and Sutherland Highlanders), Special Reserve, and to be seconded; Second Lieut. Guyon K. McDonald, Sherwood Foresters (Nottinghamshire and Derbyshire Regt.), Special Reserve, and to be seconded; Second Lieuts., Special Reserve, Chester S. Duffus, Alfred de B. Brandon, and Robert K. Muir: February 24.

Balloon Officers:

Temporary Second Lieut. T. W. Nops, E. Surrey Regt., and to be transferred to the General List: February 10.

Lieut. Arthur L. Kent-Lemon, York and Lancaster Regt., and to be seconded; Temporary Second Lieut. W. R. Nelson, R.A., and to be transferred to the General List; Second Lieut. S. Gavin, 5th (Prince of Wales's) Bn. Devonshire Regt., T.F.; Second Lieut. Merric W. Bovill, Special Reserve: February 24.

Assistant Equipment Officers:

Temporary Capt. H. P. R. Warren, Motor Machine Gun Service, and to be transferred to the General List: January 18.
Second Lieut. Cyril R. Huggins, Special Reserve; January 21.
Second Lieut. Keith D. Abercromby, Special Reserve: February 22.

Temporary Second Lieut. for duty with the Military Wing:

Acting Corp. Henry G. P. Lowe, R.F.C.: February 10.

SPECIAL RESERVE

Second Lieuts. (on probation) confirmed in their rank:

Cyril R. Huggins, Keith D. Abercromby, Donald S. C. Macaskie, William O. Russell, Alfred de Bath Brandon, Robert K. Muir, Chester S. Duffus, Vyvyan P. Spurway, F. N. Grimwade, E. Graham, J. D. Latta, M. W. Bovill.

To be Second Lieuts. (on probation):

Hywel L. Hughes: February 8.
Edward L. P. Morgan: February 15.
Archibald Livingstone-Allan: February 17.
Kenneth C. Cleaver: February 20.
Stuart S. Kennedy: January 26.

Basil M. Iles: February 2.

Thomas Macleod, Sven E. Faber, Archibald J. McWha, David R. Stitt, Arthur P. Boney, Joshua W. James, Henry R. Hawkins: March 6.

J. A. Coats: March 2.

The surname of Second Lieut. (on probation) Chester Stairs Duffus is as now described, and not as in the *Gazette* of December 23, 1915.

E. HERTS ELECTION RESULT—The result of the poll was announced at Hertford on March 10, the figures being:—

Mr. Pemberton Billing (Ind.)	...	...	...	4,590
Captain Brodie Henderson (U.)	...	...	...	3,559
Majority	...	...	...	1,031

ROYAL NAVAL AIR SERVICE

Boy mechanics are immediately required for training as wireless telegraphists in the Royal Naval Air Service. Age between 17 and 17½ in March, 1916. Pay 1s. per day up to the age of 18, at which age they are graded as Second Class Air Mechanics. Service is for the period of the war only. No promise of permanent service is possible.

Applications should be made in writing, stating exact date of birth and particulars of education received, to the Wireless Officer, R.N.A.S. Depot, Barlby Road, North Kensington. No boy need apply whose hearing or eyesight is in any way defective.

SOCIAL INTELLIGENCE

CAPTAIN B. P. GREENWOOD AND MISS DUDLEY—A marriage has been arranged between Captain B. P. Greenwood, Royal Flying Corps, elder son of B. I. Greenwood, of Shoreham, Kent, and Kathleen, daughter of the late G. H. Dudley and Mrs. Dudley, of Kingswinford, Staffs, and will take place on March 21, at St. Andrew's, Wells Street, at 12 o'clock.

FLIGHT LIEUTENANT B. TRAVERS AND MISS MOUNCEY—A marriage has been arranged, and will shortly take place, between Flight Lieutenant Benjamin Travers, Royal Naval Air Service, elder son of W. F. Travers, of Mole Cottage, Westhumble, Dorking, and Dorothy Ethel Violet Mouncey, only child of Captain D. B. W. Mouncey, Leicestershire Regiment, and Mrs. Mouncey, of 38, Elm Park Gardens, London, and granddaughter of the late Sir James Robert Longden, G.C.M.G.

The distinction of Chevalier of the Legion of Honour has been conferred upon Lieutenant Jacques Caffet, observer attached to Squadron M.F. 52.

Has given proof of exceptional courage, initiative and decision. On May 15, 1915, he was entrusted with the task of spotting fire on a heavy German gun, and fulfilled his mission successfully despite repeated attacks from enemy machines. On January 23, 1916, he volunteered for an exceptionally dangerous mission. The moment he appeared over the German lines he was attacked; although his machine was hit and all his ammunition had been expended, he nevertheless fulfilled his task unto the end, ignoring his attacker, who continued to pour machine-gun fire on to him from a short distance, and brought back news of the very highest value. (Croix de Guerre.)

IMPERIAL AIRCRAFT FLOTILLA

GOLD COAST'S GIFT—The Secretary of State for the Colonies makes the following announcement:—"The sum of £80,000 which the Government of the Gold Coast decided to contribute towards the expenses of the war is being paid in annual instalments of £10,000, the first two of which are being devoted to the provision of aeroplanes for the use of the Royal Flying Corps.

The Punjab Aeroplane fund now amounts to £85,000, and all sections of the people continue to make donations to the war funds.

THE INSTITUTION OF MECHANICAL ENGINEERS—A General Meeting of the Institution of Mechanical Engineers will be held at the Institution of Civil Engineers, Great George Street, Westminster, on Friday, March 17, 1916, at 6 p.m., when Second Lieutenant Robert W. Fenning, R.E. (T.), B.Sc., D.I.C., of London, will read a paper on "The Composition of the Exhaust from Liquid-Fuel Engines."

DIPLOMAT AS AVIATOR—M. Alexandre Nelidow, Second Secretary to the Russian Embassy and lieutenant in the Russian Cavalry Reserve, has resigned his post and left the Russian Diplomatic Service to enter the Aviation Corps. He is studying aviation in England with the consent of the British Government.

LEGAL NEWS

DUKE OF MANCHESTER'S BANKRUPTCY

A sitting was held on March 9 before Mr. Registrar Brougham for the public examination of William Angus Drogo Montagu, Duke of Manchester, who was adjudged bankrupt on January 12 last. An amended statement of his affairs showed gross liabilities of £498,034, of which £130,303 was expected to rank for dividend, and assets consisting of 1,000 £1 fully-paid shares in a newspaper company, estimated to be of no value, and jewellery and personal effects worth £200. The bankrupt stated that he was anxious to pay all his creditors in full as soon as possible.

WILLS AND BEQUESTS

Captain William Campbell Adamson, R.F.C., aged 28, of Careston, Forfar, killed in action against German aircraft, £3,924.

Capt. John Aidan Liddell, V.C., aged 27, Argyll and Sutherland Highlanders, of Basingstoke, died from wounds, £928.

PATENT INFORMATION

This list is specially compiled for AERONAUTICS by Messrs. Rayner and Co., Registered Patent Agents, of 5, Chancery Lane, London, from whom all information relating to Patents, Designs, Trade Marks, etc., can be obtained gratuitously.

LATEST PATENT APPLICATIONS

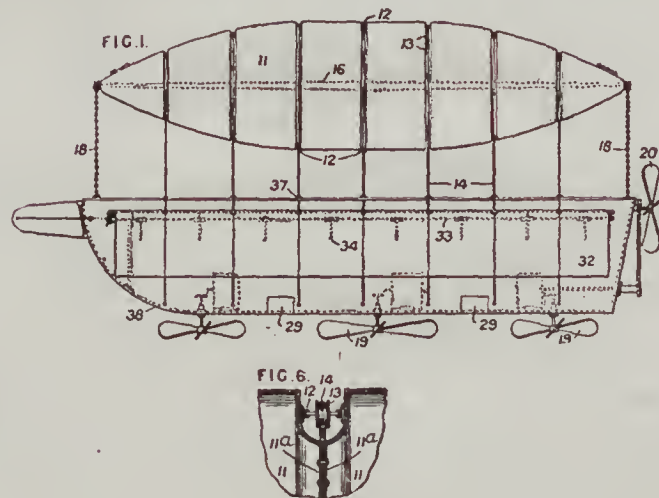
2,769	A. Bloomfield. Means for attacking aircraft. 24/2/16.
2,647	R. Caudron. Controlling devices for aeroplanes, etc. 22/2/16.
2,591	H. Morser. Anti-aircraft gun. 21/2/16.
2,899	F. A. Sutton. Device for finding range of aircraft and for notifying range to a number of stations. 26/2/16.
2,754	R. Wright. Aircraft. 24/2/16.

SPECIFICATIONS ACCEPTED

9.931	Gigot and Freeman. Flying machine.
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LATEST PUBLISHED ABSTRACT

21,898 "Aeronautics." E. Torok, 1236, Brook Avenue, New York, U.S.A. The spindle-shaped aerostat consists of a series of aluminium or other light metal gas chambers, 11, riveted together at their bases, 11a, so as to form circumferential grooves, 12, in which are journaled a series of pulleys, 13. Ropes, 14, for supporting the car, are passed over the pulleys and through eyes, 37, on the



upper edge of the car, and are secured to the keel, 38. The aerostat is free to rotate on a longitudinal shaft, 16, connected by chains, 18, to the car. The airship is propelled by a screw, 20, and is raised by screws, 19. The bottom of the car is provided with trapdoors, 29, through which bombs may be dropped.

Printed copies of the published specifications and abstract can be obtained from Messrs. Rayner and Co., at the price of 1s. each.

IMPORTS AND EXPORTS OF AIRCRAFT, 1915-1916

	Imports		Exports		Re-exportation	
	1915	1916	1915	1916	1915	1916
January	£ 20,382	1,500	435	6,399	13,706	—
February	380	6,444	138	30,693	18,823	—
	20,762	7,953	573	37,092	32,529	—

AERONAUTICS

A WEEKLY JOURNAL DEVOTED TO THE TECHNIQUE OF AERONAUTICS

(FOUNDED 1907)

Edited by JOHN H. LEDEBOER, B.A., A.F.Ae.S.

VOL. X. No. 127 (NEW SERIES)

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as a Newspaper

ONE PENNY

NOTHING IN PARTICULAR

NEVER before has the determining influence of aeronautics on present-day military operations been more signally brought out than during the last few weeks, which have witnessed the great offensive against Verdun and the resumption of active fighting in the various lands which still constitute the war zone. Those ill-informed critics who clamoured, after every puny raid on our shores, carried out by miserably inadequate effectives, with a correspondingly ludicrous result (speaking from a purely military standpoint), might well ponder over the activity of our aircraft in regions as widely scattered throughout the world as they were previously deemed unsuitable, if not impossible, for aerial operations.

Thus, neglecting for the moment the main Western theatre, our aeroplanes have during the past weeks operated in Egypt—as witness the report of the Sollum action on March 14, when “aeroplane reconnaissance discovered early in the morning that the camp at Birwar was empty,” with the result that the enemy was finally routed—east of the Suez Canal, about Salonika and the Dardanelles, off Smyrna, in Mesopotamia, and, presumably—though no official record is forthcoming—in German East Africa. One may state without the slightest hesitation, as witness the testimony of those who took part in the South-West African campaign, that it was by our aeroplane reconnaissance in the main that the fighting was brought to so speedy and successful a conclusion. These events in far-distant territories may well give us pause for thought, for they prove that the aeroplane—or, at all events, aerial reconnaissance—is the determining factor in modern warfare, whose paramount influence is bound by the inexorable march of science to grow ever more important.

Practical aviation was born some thirteen years ago; considered as a serious and effective military weapon, aviation has at the most been alive for five years, for it blossomed forth into reality with the famous Circuit de l'Est, which first turned the thoughts of the Huns from their, then, ineffectual Zeppelin monsters to the capabilities of the aeroplane. And right well have they turned to account the knowledge which thereby they gained. For the production of aircraft in Germany and Austria at the present time, as in the early months of the war, is simply prodigious; certainly it more than keeps pace with the supply of pilots; for, given the necessary facilities, an aeroplane—including the engine, and, in this respect, the Germans possess an apparently inexhaustible supply, the industry having been State-aided for many years past—can be built in three days, whereas it takes at least six months to train a really efficient pilot. Moreover, the Central Empires have to supply Bulgaria and Turkey, neither of these countries possessing an independent air service or the means to supply it with aerial machines. Hence one is forced to the conclusion that the moment the Germans have made their supreme effort, with the inevitable sacrifices which this must entail, their aerial strength will rapidly wane; if not on ac-

count of any deficiency of material, certainly by reason of the failure of man-power.

And in this respect it may be well now to point to one phase of the question of conscription which seems hitherto to have escaped notice. For our future supply of pilots we depend in the main upon the class of young unmarried men of a certain standing. Such is the fact, though the ethics of the question and even its expediency may be questionable. So, if the whole youthful male population is forthwith and progressively to be absorbed into the ranks of the Army, where are we to find our new pilots? In the case of the Army the question may admit of solution, for suitable and eligible officers can always transfer—or, at any rate, the supposition is that they can—but what of the Naval Air Service? Not a naval officer can at the present time be spared from his ordinary avocations. Yet our supply of suitable recruits must not only be kept up normally, but continually growing in increasing ratio. But whence is the supply to be drawn? Mr. Tennant alone knows.

The activity of aircraft in the Western theatre has been thoroughly characteristic of latter-day aerial tactics, as performing their allotted task in the major scheme of military operations. Firstly, it is stated, and not without reason, that the Germans selected the Verdun salient as the main objective of their great attack on account of the difficulties of accurate aerial observation in the thickly wooded country intersected by precipitous ravines along this section of the front. Other considerations apart, there is doubtless much truth in this view of the matter, for, in the relatively open country which formed the scene of the German onslaught at Mons and Charleroi, it was the observations of our aircraft which enabled Sir John French to convert what would have been a sweeping defeat into an orderly retreat, and paved the way for the battle of the Marne, which has proved the turning-point of the whole war, as history will show.

The great attack on Verdun was preluded with a symptomatic aerial bombardment of the principal railway junctions behind the French lines, with the object of preventing the bringing up of reinforcements in the shape of troops and munitions, and generally of throwing the French lines of communication into disarray. But this air attack was largely frustrated; more, it met during the later stages of the battle with a more than equivalent reply. Throughout the past weeks well-nigh every important junction on which the Germans rely has been bombarded by French aeroplanes, manœuvring in large, well-ordered squadrons. Thus Metz and Conflans, Etain and Vigneulles. Hostile aircraft have risen to meet the French and to attempt to beat them off; but in vain, or at most with an occasional but insignificant success. What person soever has followed this phase of the war with ordinary intelligence cannot fail to realise,

first, that aerial navigation has become the predominant factor in all warfare—by sea no less than by land; secondly, that in order to maintain aerial supremacy and thereby, other things being equal, the strategical and tactical initiative, the supply of airships and of the trained personnel to man them must not only be kept up to adequate strength in order to remedy wastage, but must constantly increase; and, thirdly, that any diversion of our aerial strength from its legitimate military duties, with the object of carrying out what are foolishly termed reprisals in revenge for Hun onslaughts on civilians, would be a mistake of the pro-

foundest order? No doubt it is uncomfortable for a bishop to be bombed in his palatial four-poster, but the process is equally displeasing to a soldier in his dug-out, and of far greater import from the nation's point of view. The periodical and hysterical outbursts which inevitably pervade the Press after every air raid almost make one fear that we have lost the national sense of humour on which we justly pride ourselves. Almost, but not quite. Not quite, that is, so long as Tommy is moved to describe his bayonet as a "joy-prong." For in more senses than one Tommy has undoubtedly saved the nation.

NOTES OF THE WEEK

The New Joint Air Committee

At last the membership of the hybrid joint air committee, whose official status appears to be that of a sub-committee of the Committee of Imperial Defence, as we shrewdly surmised at the time of its creation, has been announced. The Admiralty representatives selected are Admiral Vaughan-Lee, who is at the head of the R.N.A.S. (why no one quite knows), Commodore Sueter, Superintendent of Aircraft Construction, and Commander W. Briggs, who has virtually been at the head of the technical branch of the Naval Air Service since the beginning of the war, and is an able officer and a thoroughly sound technician. The War Office representatives are General Sir David Henderson, Director-General of Military Aeronautics, and Colonel Ellington. As clerk of the scales—an important position in any sporting contest—or as referee, or in whatever his precise capacity may be, we have the Earl of Derby, whose knowledge of aviation may be peculiar, but is certainly not extensive. And lastly we have the accession, apparently as an advisory member, of Lord Montagu of Beaulieu, whom I will not call an expert—for is not his colleague, Sir David Henderson, an acknowledged authority on experts?—but who at any rate possesses a sound knowledge of his subject, and is a competent and reasonable organiser to boot. Yet even with his accession I cannot but feel that an addition of further advisory members, men actively connected with the industry, would be advisable.

New French War Minister

General Roques, newly appointed French Minister of War in succession to General Galliéni, who has resigned on account of ill-health, is interesting chiefly by reason of the fact that he was the first Inspector-General of Military Aeronautics, a post he held until 1912. In his conduct of this office, which was rendered exceptionally difficult owing to several reasons during his tenure of its administration, his work was nothing less than brilliant, although he no doubt owed much of his success to the remarkable qualities of General Hirschauer, the technical commandment of the military Air Service, who is an officer and a man of quite outstanding abilities. General Roques is by no means an old man as generals go, for he was born at Marseilles in 1856, and is therefore only in his sixty-first year.

Armand Déperdussin

One had almost forgotten the name of Déperdussin, but for the fact that it is associated with a well-known type of aeroplane. Now comes the news that he is at last to stand his trial. It was on August 5, 1913, almost to a day a year before the war broke out, that M. Armand Déperdussin, Chevalier of the Legion of Honour, member of the Committee of the Aero Club of France, mæcenas of aviation, was arrested in his magnificent flat in the Avenue de Villiers for the alleged offence of having obtained by false pretences enormous sums of money, believed to amount to a total of over a million sterling. His prodigality—it is somewhat easy to be prodigal in the circumstances—was

well-nigh incredible, but, and all honour to him, by far the larger amount was spent on aviation, on his splendid factory in Paris (which was far from being a paying concern), on the magnificently equipped aerodrome at Bétheny, near Reims, and on prizes. In justice to him it should be said that he was universally popular and loved by his workmen. Mme. Déperdussin is to appear before the jury at the same time as an accomplice.

The Zeppelin Passenger Company

The German Passenger Airship Company, Ltd., of Frankfurt-on-Main, has just issued its annual report. Explaining that the war has put a stop to the company's regular activities, the directors add that the works have nevertheless been fully occupied on war orders (manufacture of parts for Zeppelins) and that the gross earnings for the year were £35,000. As the company is burdened with a heavy deficit, 1915 earnings made it possible to write off a substantial amount. The company has also derived revenue from leasing its sheds at various points like Baden-Baden, Hamburg, Frankfurt, Dresden, and Potsdam to the military authorities. So runs the official announcement, but, as a matter of fact, the company cannot be said ever to have had a truly independent existence. From its very inception it was in receipt of heavy Government subsidies, both in respect of its three airships and of its sheds. The airships, nominally privately owned, were in point of fact largely used for training the army's personnel, and were actually what may be termed auxiliary cruisers. The company has never made a profit.

A Falling Prophet

Time was when Mr. Hilaire Belloc was enthusiastically hailed as a war prophet of unerring acumen. Since then, however, he has fallen low from his high estate of yore, and, more especially when dealing with technical matters, shows that his knowledge is often sadly out of date. "The scandalous scaremongering about the Fokker is now dead, but the following point may be of service," he writes, apropos of nothing in particular, in the last issue of *Land and Water*. "The Fokker is simply a French Morane machine. It existed as a Morane machine in Germany long before the war. The German copy of the Morane machine was not a rough copy down to the smallest details and down to measurements of a millimetre for nearly all its parts. . . . There is the replacement everywhere of wood by metal, save in the battens of the wings. . . ." What the "battens" of the wings are Mr. Tennant may know; I give it up. But if Mr. Belloc desires in future to pose as an expert, I can recommend him a weekly perusal of our columns as a useful adjunct to his other studies. For instance, on January 19 they contained the following statements: "The Fokker monoplane is simply a copy of the French Morane. In accordance with German practice, it has an all-steel framework". . . . So Mr. Belloc might easily have saved himself the trouble.

J. H. L.

PHYSIOLOGICAL TESTS FOR PILOT CANDIDATES

CANDIDATES for the post of pilot in the French flying services now have to undergo what may be described as a physiological examination to test their fitness, an important consideration where, as in the case of aviation, special and exceptional physical and mental qualifications are essential. The following, according to the *Matin*, are among the tests imposed:—

First of all, the candidate is required to exert with both his hands a rhythmic and continuous pressure, which is automatically recorded on the drum of a registering instrument, and then, by means of what may be described as a species of revolution indicator, transcribed—again automatically—into kilogrammetres. Next he is placed before a dial before

vous system will always betray, by means of its reflexes, any disturbing effect exerted upon it by his senses.

A pilot must remain imperturbable both mentally and physiologically. In spite of danger and fatigue, his organism must be constantly ready to respond instantly not only to the behests of his will, but to the reflex action acquired during the period of his training. Unless this is the case, his muscular fatigue will go on increasing during flight. The first qualifications that go to make a good pilot are mental impassivity and rapid reflexes.

Experience already obtained from the system above outlined has already revealed certain general facts. Broadly speaking, the muscles of the arms should furnish a muscular



THE HARBOUR AND DOCKS AT NEWPORT NEWS, VIRGINIA

Photographed from a Curtiss Seaplane. One of the vessels in the picture is the *Appam*, just brought in by a German prize crew

which a needle is rotated by clockwork at the rate of one revolution per second: the moment the needle is thrown out of gear the prospective pilot has to stop it by moving a small lever—this, of course, serving as a test of the rapidity of his reflex action. Lastly, a registering instrument is placed in his hands, while other instruments are placed in contact with his thorax or pulse to record any variation in his respiratory and circulatory rhythm.

Suddenly the pupil is subjected to a violent sensation—in the form of a magnesium flash-light, an explosion, etc. If he retains complete control over himself he may show no visible emotion; but the Marek recorders will inevitably record the slightest trembling of the hands, a quickening of the breath, or any pulse acceleration. A strong-willed man may be able to control outward appearances, but his ner-

ve effort of 150-200 kilogrammetres without any slowing down in the rhythm of movement, which is the intallible forerunner of fatigue. The lapse of time between the perception of a loss of equilibrium and the corrective re-action should vary from 0.15 to 0.23 seconds. Lastly, the normal organic re-action or disturbance should be brief; above all, it should attain its maximum at the exact moment of the perceptive impression, and not increase thereafter.

This novel physiological test possesses more than a cursory medical interest; for, if it be generally adopted, it should lead to a great saving of life and material, by the elimination both of those who are unfit from the beginning (pupils who will never make good pilots) and of those seasoned pilots—and, as is generally known, such cases do occur—who have temporarily lost their nerve.

RECOLLECTIONS OF AVIATION IN THE ARGENTINE AND CHILI

By HUBERT F. FISHER, of the Argentine Aero Club

IN this attempt to put together a few notes on the above subject I trust I may be forgiven for date errors that may creep in, as I have to rely almost entirely upon my memory. At the present moment things are at their lowest ebb in the flying world in South America generally. Since the late George Newberry met with his fatal accident on March 1, 1914, the movement in aviation has been gradually becoming less and less. This has, of course, been partly due to the financial crisis that has existed in South American countries previous to the war, and then since the war there has been the difficulty in purchasing new machines, etc.

One cannot write about aviation in the Argentine without the name of George Newberry figuring largely. He was

Newberry was almost instantaneously killed, and Ximenez Lastra very badly injured. This, however, has not prevented Lastra from joining up to the French Flying Corps, with which fine body of men I believe him still to be on active service.

Although George Newberry's ticket bears the same date, the actual owner of ticket No. 1 in the Argentine is Emile Aubrun, a Frenchman; No. 2 is held by the well-known leading Argentine comedian, F. Parravacini. Newberry's ticket was No. 8, and was obtained on a Bleriot monoplane, with a 35 h.p. Anzani engine. I do not think any of these first aviators made any eights or passed any real examination, as at that time the Aero Club Argentino was not affiliated to the F.A.I. P. Castaibert, who took ticket



THE AERODROME OF SAN FERNANDO

the *alma mater* of aviation in that part of the world. On February 11, 1914, G. Newberry beat the altitude world's record, beating Legagneux, who then held it at 6,120 metres, by 105 metres, Newberry's altimeter recording 6,225 metres. This world's record was not, however, recognised by the F.A.I., owing to there being a regulation that 150 metres more must be indicated over the actual record. Newberry was a splendid all-round sportsman; champion boxer, expert fencer, horseman, and motor-car racer, and, in fact, prominent in anything to do with sport.

His loss was felt very keenly by all who knew him. It may be remembered that G. Newberry was killed whilst training for his projected flight across the Andes, *i.e.*, from Argentine to Chile, a trip that is considered to be very much more difficult than that over the Alps. Newberry had his machine—a Morane-Saulnier—in Mendoza, and was practising with Lieutenant Ximenez Lastra as a passenger. Whilst executing a sharp turn, banking too much, he side-slipped, and, apparently losing control, the machine fell.

No. 12 in June, 1912, owns the first Argentine ticket taken after the club was affiliated to the F.A.I. The previous eleven tickets were then extended by the F.A.I. without further trials having to be made.

In No. 11 ticket we come across Teodor Fels' name, who is well known as having been the first soldier to fly across the River Plate from Buenos Aires, Argentina, to Monte Video, Uruguay, at the same time getting into trouble with both nations; with Uruguay for landing in their country without permission, etc., and with his own military authorities for having taken one of their machines away from the country without authorisation. He was arrested and court-martialled, but soon released unpunished, as in the public eyes he had become a hero, being only a youngster of about nineteen years and the flight being a then record distance for South America, almost the whole journey having been flown across the water. T. Fels was a great friend of G. Newberry's, and, unfortunately, he was present when Newberry was killed. The sight affected him so much that

he has not been in a machine since. Thus the same day Argentina lost two of her best aviators. In ticket No. 14 we come across A. R. Mascias's name. Mascias refused to have ticket No. 13, so there is no No. 13 granted. Mascias was very closely associated with G. Newberry, so much so that when the latter was by his death prevented from flying over the Andes, Mascias vowed that, for the honour of his friend and his country, he would make the attempt. The following year Mascias proceeded to the district of Mendoza, which is on the Argentine side of the Andes, and there he commenced his trials for altitude on a Morane-Saulnier. On one of these trials, at a height of approximately 6,000 ft., Mascias got caught in a wind that completely dominated the machine, and he fell in a series



A. R. MASCIAS

of twists and turns until within 400 feet of the ground, at which height a strong cross wind caught the machine, straightening it out sufficiently to enable him to bring it to the ground almost under control, but not enough to prevent a very nasty landing among boulders that completely

wrecked the machine. Mascias fortunately escaped with only a bad shaking, but it was a frightful experience, as Mascias was no youngster.

Aviation in the Army

In October, 1912, the Argentine military authorities, who up to that time had paid practically no attention to aviation, appointed a technical commission for military aviation. The members of this commission were selected from the members of the Argentine Aero Club, and in a sense the technical work was done by the Aero Club for the Army until quite recently. In fact, it was only on December 11 of last year (1915) that the Argentine Aero Club addressed a letter to the Minister of War in which it expressed the opinion that the time had now arrived when the club felt it could no longer justifiably hold that technical direction over military aviation, as the army now possessed in its fifth arm officers of sufficient experience and ability to take care of any problem of a scientific character that might present itself.

Among the men who first formed this commission were George Newberry, Albert R. Mascias, and Horacio Anasagasti, all three well known in Paris and London, and four others not so well known.

This year the Argentine Army have made a number of changes in their fifth arm, and have mapped out a splendid programme. Lieutenant-Colonel Don Alejandro Obligado has been appointed Director of the Military Aerodrome. It only remains for them to get hold of the machines on order, and then this arm will go ahead in fine style. The machines actually in use at the Military Aerodrome, I think, are the following:—One M. Farman, 80 h.p. Gnome; one M. Farman, 50 h.p. Gnome; one Bleriot, 50 h.p. Gnome; one Morane-Saulnier, 80 h.p. Le Rhône, and 80 h.p. Gnome for same; and not in use are two Nieuport monoplanes, with 100 h.p. engines, and one Voisin Demoiselle.

(To be continued)



ANOTHER VIEW OF NEWPORT NEWS, VIRGINIA

(Note the air station in the foreground, with its sheds and a machine immediately behind them)

RANDOM REMARKS

XLI.—MY OWN AEROPLANE By ARTHUR LAWRENCE.

I SUPPOSE it just happened. I am not going to bore my reader beyond the point to which he has now become accustomed by any relation of the amount of duffers I had to employ before the Pterodactyl-Maupassant-Lawrence aeroplane came into being. I was not quite so clever as the German Professor who evolved a camel out of his own inner consciousness. I was hindered by expert opinion. I had read every word of our detractors, who told us, for instance, that the Fokker was wiping us out of the air. I didn't believe them, but I made the most careful notes of their suggestions. I gave those suggestions the real Lawrence "touch." I saw I was dealing with inflammable stuff: dead wood and fibre, which would flare up into something truly appalling if I applied to the collection my own torch of genius. That is all I need say as to how my aeroplane assumed a profound and overwhelming significance.



FLIGHT IN THEORY AND—

I hearken unto bright young men like my Chief—by whom I mean the editor of this worthy paper—who have glided thousands of miles on these new-fangled things with their powerful motors. I listen to these practical aviators with the greatest respect, but sadly I shake my fast-whitening head at the thought of the times that are no more. History will never know the hours I spent with thee, dear Major X., now, I trust, where flight is the normal life of the soul, poring with thee over great works which proved quite conclusively that, if you could imitate the flight of birds, you would—well—you would fly.

Then there was my dear old friend with the feathers (he is also deceased)—feathers which were fifteen feet in height—wert thou not photographed beside them to show that their height to thee was as three to one? Then all these ponderous speculations were "downed" by the wretched simplicity of the Wright brothers and others who attached powerful motors to the old gliding planes and so settled the matter to their own satisfaction. My hat is off and my knees bent to all lusty aviators who glide over the German lines and do

deeds which make me ashamed to exist as a mere slinger of ink, but there is no bird, not even a fieldfare, let alone the lark from on high, which will not merrily chirp to me that these rigid affairs do not "fly." These big, rigid boxes are drawn or pushed along in a glide. It was Pégoud—was it not?—who first tried to break the spell by venomously turning the whole thing upside down—while the birds wondered—but nothing flapped, so that, so far as I am concerned—and, as a very old student, I am entitled to an opinion—even that was not flight. Watch the lark make its ascent, and you know the joy of true flight.

Of course, my own affair was jointed in every part. It was necessary for me to get from my own house to Hendon, and, consequently, I had to submit to the attachment of a 1,000 h.p. motor, which was designed for me by Sir Moses Axiom, who, in his own day, designed a mighty affair which lifted itself enough off the ground to smash itself up in proud desperation. When recumbent, the wings, or planes, were so canted up that it looked like a butterfly alighting upon a well-favoured flower, but in motion it resembled our prints of the pterodactyl, from which, its decadence, and my assistance, it derived its triplicate name. The heavy flap-flap of the wings which did not help the flight of my aeroplane, but worked in accordance with the speed of progress, gave the thing such a vulture-like aspect that its appearance would have a deleterious effect upon the morale (I will have the final "e," please) of the enemy.



— IN PRACTICE

Arrived at Hendon, I was confronted with a crowd of admirers. There was nothing lacking to complete the triumph of my arrival. The janitor wanted to charge me half-a-crown for admission. The Press agent told me that stimulant could be obtained at all hours if I made it worth while. Cameras clicked all around me. The editors of three aviation papers competed with one another in removing my gloves, and the poet of the aerodrome struck the lyre until he was struck in his turn. At last the Autocrat arrived on the scene. He took a professional glance at my effort. "C'est assez," he cried, knowing the language, "c'est fait accompli. The war is now ended. The Germans are completely—what do you call it?—'done in.' " . . . The scene was changed. I heard the words: "Arise, Sir Arthur." I arose from my knees. One of them made a noise like a pistol shot—which woke me up.

PROGRESS OF AMERICAN AVIATION

By ERNEST L. JONES, American Editor

NEW AERO ENGINES

STILL more engines are coming on the American market. The 150 h.p. six-cylinder and 300 h.p. twelve-cylinder engine of W. L. Fairchild and Jay R. Westerfield is to be

with aeronautics, has an order from the Navy for a motor of around 100 h.p. The Knox Motor Co. is developing a 300 h.p. motor, the details of which are being kept secret. The Sterling Engine Co. has side-tracked its aero motor,

FUTURE-AIR-FIGHTERS-OF-THE-BRITISH-EMPIRE

IN-TRAINING-AT-ATHACAS-N.Y.



HARRY A. SOMERVILLE
MONTREAL



WALTER R. KENNY
OTTAWA



JAMES S. MAINLAND
MONTREAL



MOSTYN LEWIS
MONTREAL



JOHN C. AUSTIN
MONTREAL



WARREN PECK
MONTREAL



ROSS WALLACE
MONTREAL



CHARLES DRUMMOND
MONTREAL



JAMES F. WHITE
MONTREAL



JOHN BOOTH
OTTAWA



HELEN WILSON
MONTREAL



RONALD M. REISTEND
TORONTO

THE AVIATOR

ON I CLAMBER UP HIGH TO THE VAULT OF THE SKY
 FAR ABOVE ALL THE MUCK OF THE TRENCHES
 FAR ABOVE THE QUICK FIRE OF THE MAXIM GUN
 FAR ABOVE ALL THE RIFLE AND THE STEEL
 THERE'S A PUFF FROM BELOW IN THE LINES OF THE FOE
 WHEN A GUNNER IS SIGHTING TO HARM ME
 BUT I DROP AND I RISE FROM HIS BOMBS IN THE SKIES
 AND I STILL AM THE EYE OF THE ARMY
 FOR IT'S MY JOB TO LEARN EVERY SALLY AND TURN
 OF THE ENEMY RIGHT WHEN THEY MAKE IT
 I'M A SENTRY WHOSE CARE IS A POST HIGH IN AIR
 AND IT ISN'T FOR ME TO FORSAKE IT
 SO I DUCK AND I SKID AND I DOGE AND I DIP
 FROM THE AEROPLANE SHELLS THAT WOULD MARE ME
 WHILE THE GUNNER WITH ZEST DOES HIS SUNDAY SCHOOL BEST
 TO PUT OUT THE EYE OF THE ARMY
 NOW THERE ISN'T MUCH CHANCE FOR THE ANCIENT ROMANCE
 IN THESE DAYS OF MECHANICAL SLAUGHTER
 WHEN WE SHED HUMAN BLOOD IN A HORRIBLE FLOOD
 ON THE FACE OF THE LAND AND THE WATER
 BUT I AM NOT BOUND BY THE SOLDIER'S ROLL ROUND
 FOR IN WAR'S MIGHTY DRAMA THEY STARE ME
 AND IT'S STILL A GREAT GAME FULL OF GLORY AND FAITH
 FOR THE VENTURE SOME EYE OF THE ARMY







THOMAS PILOTS AND CRAFT

produced by the Bournonville Motors Corporation. The Orlo Motor Co., heretofore never heard of in connection

due to pressure of motor-boat business, and the Deussenberg Motor Co. has not yet become active. Fans are also

wondering when the sixteen-cylinder engine of the Burgess Co. will be out; this has been in course of experimentation at the plant of the White motor car for many months. The Aircraft Co. is reported to be working on a 150 h.p. motor, and changes are being made in the Ashmusen twelve-cylinder opposed motor before it will actively bid for orders. The Electric Boat Co. has an eight-cylinder 250 h.p. motor under weigh, and the Simplex motor-car concern is expected to build future Wrights.

NATIONAL ADVISORY COMMITTEE

AT the meeting of the Executive Committee of the National Advisory Committee for Aeronautics, held on February 10, it was decided to prepare and issue general specifications covering the requirements of aeronautics in the lines of indicating instruments for the navigation and operation of aircraft.

The annual report of the Advisory Committee, which was submitted to Congress, ordered printed, and then disappeared

built for the Navy. Although the weather has been very unsuitable for aero-marine work a number of flights have been made. This class of six hydro-aeroplanes was completed early during the present month, and shipments were to begin the moment the builders were satisfied that the type was thoroughly satisfactory in every respect, this being particularly important in the case of training machines to be used by men not greatly experienced in the operation of flying craft.

Lieutenant G. D. Murray, U.S.N., is at Marblehead inspecting the work on the Navy aeroplanes for the Navy Department, together with Chief Mechanician F. B. Conway, U.S.N. Every part of every Navy machine has been examined and stamped during the course of construction.

FOR PAN-AMERICAN FEDERATION

The Aero Club of Chile has invited the Aero Club of America to send delegates to a conference to be held under the auspices of the Aero Club of Chile. The Club appointed Messrs. Santos-Dumont and Cortland F. Bishop as its delegates, and Dumont has gone to Santiago. Some of the articles of the proposed Constitution of the Aeronautic Federation of the Western Hemisphere are:—

Art. 1. Under the name Aeronautic Federation of the Western



VERNON CASTLE IN FRONT SEAT, AND VICTOR CARLSTROM, INSTRUCTOR
AT THE CURTISS SCHOOL, NEWPORT NEWS, VA., AT REAR

from public acquisition, is now in the hands of the Public Printer, and it is expected that it will be issued in the near future.

PROGRESS OF THE NAVAL AIR SERVICE

W. Starling Burgess, President of the Burgess Company, of Marblehead, who has just returned from the Navy Aeronautical Training Station at Pensacola, where he was supervising the official tests of the Burgess-Dunne war seaplane, reports great activity among the Navy fliers. The performances of the Dunne, flown by Clifford L. Webster, of the Burgess squad of aviators, gave thorough satisfaction to the Naval authorities, although the tests were greatly hampered by the failure of the motor to work properly.

Aviator Walter H. Johnson, of the Curtiss Aeroplane and Motor Co., has been at Marblehead during the past two weeks engaged in testing the new Burgess school machine, especially

Hemisphere is established a union of the clubs and societies that control aeronautics in their respective countries in all the nations of the American Continent.

Aeronautics will be directly represented in this Federation by the recognised club or society of each country.

Art. 4. The Federation is charged with the regulation of aeronautics on the American Continent.

Art. 5. The Federation is directed and administered by a Board composed of a president, of ten vice-presidents, of a secretary general, of a recording secretary, of a treasurer, and of five delegates from each country.

Art. 16. Each country represented at the conference shall be entitled, according to the degree of its aeronautic activity, to a certain number of votes, which shall be fixed for the first time at the moment of the country's definite admission.

Votes will be assigned to each country in proportion to the total number of its certificated pilots.

MODEL AEROPLANES—XXVIII

By F. J. CAMM

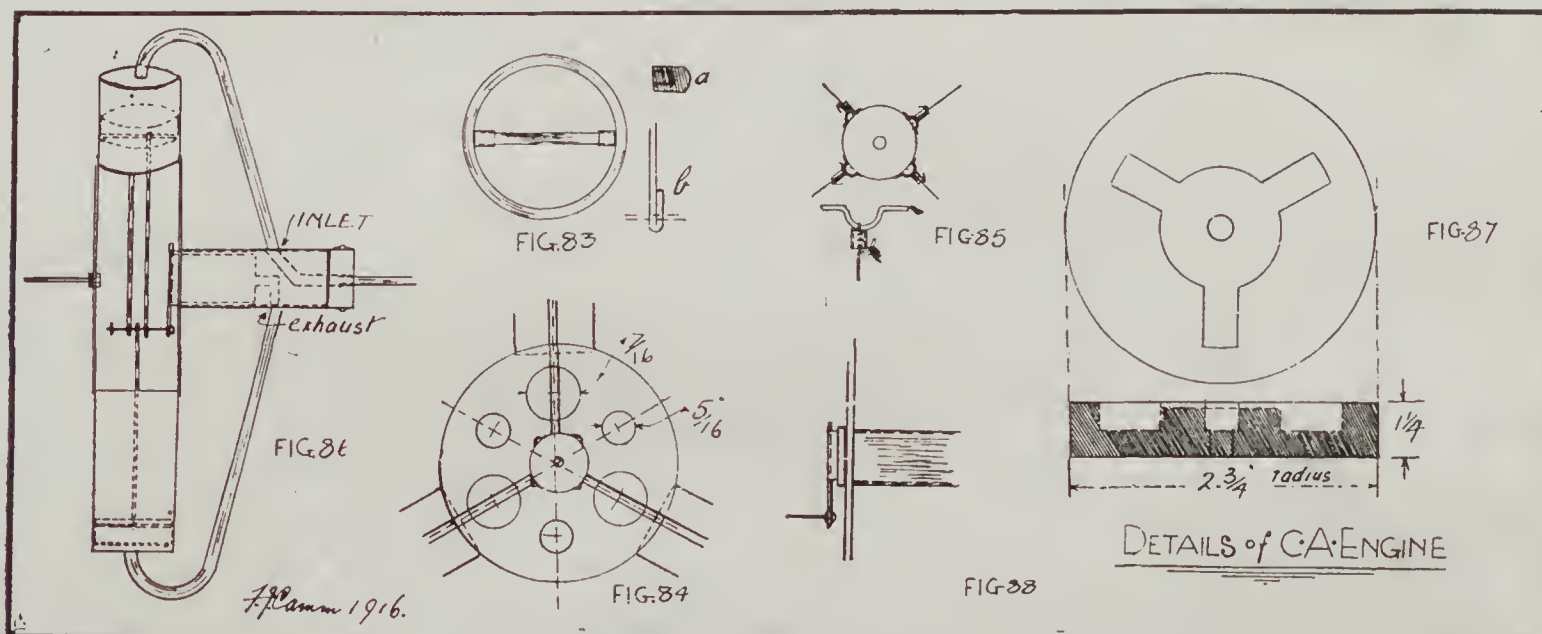
AN enlarged view of the gudgeon pin fixture is given in Fig. 83. The small brass blocks shown sectionally at A are soldered inside the piston. They are cut from square section brass rod, the surface engaging with the piston being filed to a radius to correspond. Each block is only partly drilled through to receive the gudgeon pin. When fixed, the distance between the bottom of the two holes should be $\frac{1}{64}$ th in excess of the length of the gudgeon. One block only should be soldered in first. It will be necessary to pass a gudgeon pin through a connecting rod and solder the second block in assembled. Great care is necessary to ensure that the gudgeon pin is exactly at an angle of 180 degrees to the line of travel of the piston, and to ensure this the position of each block should be checked, from the lower end of the piston, with a depth gauge. To correct any inaccuracy, place the heated soldering iron *outside* the piston opposite to the block, and move the connecting rod in the desired direction when the solder flows. It is upon the fitting up of the motor that its success depends; too much care cannot be taken with a small motor of this kind to make everything as lightly as possible and to locate everything correctly.

The lower ends of the connecting rods are turned back and hammered flush (see B) to provide a more solid bearing

Secondly, the three feed pipes must be bent to the correct radius. The best plan to adopt would be to cut a wooden block to the correct angle and radius, and use this as a template.

To bend the tubes (which should be cut an inch longer than necessary), fill them with fine silver sand so that they do not crush in during bending and plug the ends with wooden pegs. Now heat the tubes in a spirit flame and beat them with a wooden mallet to the form of the template. Withdraw the pegs, force the sand out, and cut each tube off to the correct length, chamfering the ends to fit into the seatings drilled for them in the cylinder head and sleeve.

In Fig. 87 I show an assembling jig, which will be essential to accurately locate the cylinder upon the back plate. It should be cut from ash to the radius indicated in the drawing. Through the centre of the block a hole is drilled sufficiently large to allow the sleeve to pass freely. Next a recess is counterbored, as shown in the sectional sketch, to a depth equivalent to the thickness of the plates. The final operation is to sink three slots of the same size as the cylinder, into which these latter are placed when assembling. The depth of the slots must be such that the cylinders are flush with the bottom of the plate recess.



upon the crank pin. It will be obvious that only one connecting rod is attached centrally to the piston, the others being fixed $\frac{1}{16}$ th of an inch out of centre to give clearance upon the crank pin; a $\frac{3}{32}$ rd of an inch clearance should be given between the gudgeon blocks and tubes constituting the "small ends" of the connecting rods.

Fig. 84 gives the method of setting out the back plate for lightening holes. The centre hole, that receives the revolving sleeve carrying the inlet pipes, must be drilled to *exactly the same diameter* as the sleeve itself. To do this a $\frac{1}{8}$ th hole is first drilled, and this is opened out to within a $\frac{1}{64}$ th of the desired size. A taper reamer is then passed through and the hole opened out until the sleeve can be barely forced in. A tap on one end with a piece of wood will drive it home. Now tap it until it grows truly from the plate (checking it at various points with a square) and silver solder.

There are two other details to be dealt with before we can commence the assembling of the parts. Firstly, four wiring eyes will be required, from which the plant will be suspended in the machine in a manner to be described subsequently. Fig. 85 illustrates their shape; they are bent from 20 s.w.g. piano wire and soldered round that portion of the crank-shaft which abuts the sleeve. The position of them will be apparent from the side elevation (Fig. 86), from which the relative position of the various parts will be clear.

With this jig the assembling of the engine (otherwise a difficult matter) is reduced to simplicity. The three cylinders are placed in the three beds and the back plate is seated down in its recess (with, of course, the sleeve protruding). The cylinders are now soldered to the plate, any superfluous solder being scraped away afterwards. Extract the plate and cylinders, and slide the pistons and crank-shaft into place. Place the front plate in the recess and locate the three cylinders into the top of the beds, and temporarily solder each to the plate, finishing the soldering by reversing the engine in the jig and "flowing" the solder round the joint. Between the crank-shaft and back plate a washer is inserted—it should be of width sufficient to allow $\frac{1}{100}$ th of an inch end play between the shaft and sleeve. A sketch of it is given by Fig. 87.

The throw of the crank should be fixed for convenience of working before the front plate is attached; and perhaps it will be found better to solder the feed pipes into position before assembling the crank-shaft, to avoid the possibility of soldering the shaft and sleeve together. All parts should be lubricated with the machine oil, diluted with paraffin.

(To be continued)

NOTE.—We shall be pleased to reply to queries relating to model aeroplanes and kindred matters. To ensure a reply in the following week's issue queries must reach us not later than Monday.

STATEMENTS IN PARLIAMENT

HOUSE OF COMMONS

March 14. *Mr. Pemberton Billing*—Mr. Pemberton Billing was introduced by Mr. R. McNeill (Kent, St. Augustine's, U.) and Sir H. Dalziel (Kirkcaldy Burghs, L.), and took the oath and his seat for East Hertfordshire, in succession to Sir J. Rolleston.

During the course of his speech, Mr. Tennant, Under-Secretary of State for War, made the following references to the Air Service:

He now came to a branch of his subject which had caused a great deal of stir not only in the House but in the Division of East Herts. It was a great mistake to suppose that the Government had not been fully seized with the importance of the defence of the country against hostile aircraft or that they had regarded it as a matter of secondary importance. On the contrary, they looked upon it as a matter of primary importance. It was useless to increase the size of our Army abroad if the bases from which those Armies drew their supplies and ammunition were going to be ruined by hostile aircraft. The best guns and the best gunners must be employed on the all-important duty of defending these bases.

The right honourable gentleman continued: The position in regard to anti-aircraft guns, although it leaves a great deal to be desired, is better to-day than it had ever been before. We have provided at Shoeburyness a training school for gunners where a large number of officers and men are being taught the difficult task of shooting at objects in the air. We have established an organisation of defence which for London is complete and for the provinces is approaching completion. For London there have been provided aeroplanes, landing places, and lights. The House should realise that in this matter the possibilities of provision for defence were unlimited. It was difficult to conceive finality in any such provision. For London defence had been completed on an agreed scale; and we are applying it to the rest of the country. When more material is available the standard of these defences will be raised and more improvements made.

Mr. Lynch (Clare, W., Nat.): What is the exact meaning of the word "complete"? Does it mean that Zeppelins will be prevented from coming?

Mr. Tennant: I said the organisation was complete.

When war broke out it was realised that a great extension of the Royal Flying Corps would be necessary. The success of that development depended upon simultaneous progress along four lines—the provision of aeroplanes, the provision of engines, the supply of mechanics, and the training of pilots. At the outbreak of the war the design of our aeroplane was not inferior to that of any other nation, and during the war we had kept pace with advances made abroad, though we had from the outset always been handicapped by the want of engines. There were very few firms prepared to undertake to make aeroplanes, and especially engines, so that when war broke out we were behind France and Germany in the manufacture of engines. All these difficulties had been met by the energy of the supply branch of the service, with great assistance from the Ministry of Munitions. A great proportion of the engines now in use were of British design and a great majority were of British manufacture. A real supply of British high-power engines was now coming forward and would produce a marked improvement at once. Every squadron had its full complement of skilled mechanics, and more trained pilots were now being turned out every month than we had been able to mobilise from all our resources in August, 1914. This output could be largely increased in the near future.

Mr. Pemberton Billing (Herts, E., Ind.) said he left the Royal Naval Air Service because he felt that unless some man who understood the exact position of affairs came to the House with the backing and the authority which only a constituency could give him, the Service would remain a byword among members and the subject of almost tragic mirth in its hopeless, futile attempts to defend this country.

He had listened with considerable interest to what the Under-Secretary of State for War had said on matters connected with the Air Service. The one remark he had to make upon it was that he was sure he was grievously misinformed. Eighteen months ago we had at the disposal of the Air Service about one-twentieth of what we had to-day, but we succeeded in reaching Zeppelin bases and carrying the air war into the enemy's country. That proved that, though our material was lacking, our personnel was such that we were able to carry out raids successfully. Therefore he definitely joined issue with the First Lord of the Admiralty in his statement that the lack of material was responsible for our present policy of masterly inactivity and deplorable delay. For the first six months of the war the Air Service was rich in leadership. In the last six months of the war the material had improved as well as the leadership.

The crux of the whole question of the Air Service at present was one of personnel, and by personnel he meant beginning with the chief, whose appointment should not be a mere political concession, but the creation of a definite leadership carrying with it the support and confidence and loyalty of the entire Service, and embracing also the human material which would be the sound

heart of such a Service. Once we got the right man at the head the personnel and the material would grow. We should have a vigorous offensive instead of the present impotence. He had in his mind to place before the House his own detailed proposals for the immediate strengthening of our power in the air, for the creation of an Imperial air service, but he proposed during the coming air debate to deal fully and freely with all the facts and figures. If he might make a general criticism, he would say that if we had such committees as were found in the French Chamber—(cheers)—it would be an easy matter for him to lay before them all the correspondence and technical information he had. He felt sure that the Service would take kindly to such a course. We could strike now in the matter of aerial defence. We must strike now. He earnestly appealed to Mr. Balfour to take his courage in both hands and issue definite orders that all the existing material we had should be immediately employed in raids over the enemy countries.

He was quite sure that we had the material. He did not propose to give the facts and figures unless he was challenged. He quite appreciated what a mark a Zeppelin shed was. It was as vulnerable as the Crystal Palace. We possessed the machines to reach them. We heard and read of a new Trafalgar. There were rumours of a coming aerial raid. Was it too much to ask that our Grand Fleet should cease to be handicapped in its movements by this never-ceasing flow of information conveyed to the German Admiralty by the spies in the air? We must exterminate the Zeppelins; we could do so. We had all the material ready to initiate air raids on a very great scale. When they considered that twelve months ago last November we partly destroyed a Zeppelin factory at Friedrichshaven with three machines which would now be looked upon as old-fashioned, three pilots, and eleven bombs, and then considered that to-day we had a hundred times as many machines, a hundred times as many pilots, and more efficient bombs, and that our machines were capable of carrying loads of explosives from four to ten times as great, was it to be wondered at that the public had become slightly indignant that no action was taken? The right hon. gentleman had suggested that we had neither the machines nor the pilots. He should be pleased to introduce him within twenty-four hours to a hundred pilots, to lead him by the hand to the machines, and to put the bombs on the table of the House.

This war might possibly eventually be determined in the air. And at the cost of two or three days' hostilities we could gain and maintain supremacy in the air. Was it to be wondered at that the country should be demanding that our material should be used; that the men in the Service were demanding that they should be sent out to fight, instead of staying at home? He earnestly asked Mr. Balfour to insist, not in six months' time, not in six weeks' time, but if necessary in six minutes' time, that the material which was now waiting, the bombs which were now being stored, which were due for delivery in many places in Germany, should be delivered forthwith and without further delay.

March 16—*A British Rigid Airship*—Dr. Macnamara (Camberwell, N.) informed Mr. Brookes (Mile End, U.) that the rigid airship which was under construction for the Admiralty at the beginning of the war was now being completed.

R.N.A.S. Officers—Dr. Macnamara stated, in answer to Mr. Brookes (U., Mile End): There are no naval officers without experience and knowledge of air service requirements in important administrative positions in the Royal Naval Air Service.

Precautions Against Air Raids—Sir A. Gelder (R., Brigg) asked the Under-Secretary for War whether he would take immediate steps to request the various railway companies and river and port authorities to extinguish all signals and other lights on railways, rivers, and docks during any period of active Zeppelin visitation, wherever trains and other traffic were brought to a standstill, as signal and other lights of similar description had proved a direct guide to large cities and towns that had recently been raided.

Mr. Tennant replied that the matter was entirely within the control of the Field-Marshal Commanding-in-Chief the Home Forces, who would issue all the instructions necessary to secure the desired object.

Mr. Ashley (U., Blackpool) considered that the position with regard to the predominance in aircraft at the front was precarious, and if anybody had command of the air it was the Germans and not ourselves.

Mr. Long: An allusion had been made to Lord Derby and war in the air. Lord Derby, as Chairman of the Joint Committee on War Air Service, had full power, and already valuable work was being done in relation to air machines. He was now adding to the Committee one or two gentlemen whose names would shortly be published, and if Mr. Pemberton Billing laid his suggestions before the Committee they would no doubt be sympathetically received. (Hear, hear.)

Sir H. Elverston (L., Gateshead) asked that the members of the Anti-Aircraft Corps of the Royal Naval Air Service now engaged in the defence of London should be retained in their present position.

March 16—*Raids on Enemy Aircraft Bases*—Dr. Macnamara, replying to Mr. Pemberton Billing (Herts, E., Ind.), said: All operations by naval forces are carried out by officers acting under the authority of the Board of Admiralty. In some cases orders are given directly from the Admiralty; in other cases they are given by Commanders-in-Chief, or other responsible officers.

Mr. Pemberton Billing asked whether the Royal Naval Air Service had been prevented from carrying out reprisal raids owing to the religious scruples of any member of the Board of Admiralty; and, if so, did the First Lord of the Admiralty propose to allow personal and private views to stand in the way of our effective offensive.

Dr. Macnamara: No personal or private views influence the Board of Admiralty. My right hon. friend knows nothing about the religious opinions of any of his colleagues. (Laughter.)

Mr. Pemberton Billing: Why have not the orders been given?

Dr. Macnamara: That question does not now arise.

Mr. Nield (U., Ealing) stated that on the occasion of the last air raid no communication was sent by telegraph by the War Office to an anti-aircraft station (the name of which he would communicate to the right hon. gentleman), which was right in the middle of the disturbance. Although the towns in the immediate proximity of the anti-aircraft station were duly warned and had their lights out, the raid was only made known at the station in question by next morning's papers.

HOUSE OF LORDS

March 15—*The Inter-Departmental Air Committee*—Lord Montagu of Beaulieu asked the Earl of Derby, as representing the Inter-Departmental Committee on Air Service, what the functions of that Committee were, and if he could give any information as to the work it had done.

The Earl of Derby: I am glad to think that the noble lord will know the functions of the Committee as well as I do, because he has consented at the request of the Prime Minister to come on the Committee. I am sure nothing can give greater confidence to the country at large, that the Committee will endeavour to do good work for the Air Service, than the appointment of Lord Montagu as one of its members.

The chief ends to be attained by the Committee are to ensure that the manufacture, supply, and distribution of material required by aircraft are in accordance with the policy of aerial warfare laid down by His Majesty's Government, to avoid clashing and overlapping demands on the manufacturing resources available, whilst securing the full and harmonious use of the same, and to eliminate correspondence between the Departments on points which affect more than one. This Committee has nothing to do with the defence of the kingdom. That is quite rightly left in the hands of Lord French. Air policy is not framed by the Committee, but may, of course, be affected to a certain extent when we go into the question of production of air-

craft by the information we are able to give to the War Committee. The air policy has been laid down by the Government. Each branch of the Service has its own duty to perform and the duty of the Committee is to see so far as it can that all that each branch requires to carry out the policy laid down is placed at its disposal. It is to prevent overlapping, to provide closer inter-communication between the two Departments that the Committee has been formed, and even in the short time we have been in existence we have been able materially to help to join the work of the two branches of the Air Service. A particular type of aircraft was put at the disposal of one branch, whilst in return that branch was able to release other machines which were more useful to the naval branch. I hope we shall increase the output. We have at present no executive work; the executive work is carried out by the two branches of the Air Service. But I feel that this Committee is only the beginning of what may be a very large departure in this kingdom. (Cheers.) I hope that we shall be able to bring the two branches so closely together that there can be no question of competition between the two, and I am strongly of opinion that we shall be able to justify the confidence that has been placed in us by His Majesty's Government.

Lord Montagu said that at the request of the Prime Minister he had become a member of the Committee. He felt it to be his duty to help in every way he could. He trusted that what Lord Derby had said about the extension of the work of the Committee would take place before long, for he felt it should be the nucleus of something much larger, and which would be able to do more than the present Committee was doing.

Lord Rathcreedan: He felt now that the time had come when the Government must take control of all the fighting manhood of the country. In that way they could secure the best men for the work for which they required them, and in particular for the Flying Corps and for the construction of aircraft.

THE JOINT AIR COMMITTEE

In a written answer to Mr. Warwick Brookes, Dr. Macnamara says that the Joint War Air Committee is constituted as follows: Chairman—The Earl of Derby.

Admiralty Representatives—Rear-Admiral C. L. Vaughan Lee, Commodore Murray F. Sueter, C.B., and Squadron-Commander W. Briggs, R.N.

War Office Representatives—Major-General Sir D. Henderson, K.C.B., D.S.O., Lieutenant-Colonel E. L. Ellington.

Advisory members may be added as required.

The secretariat consists of the secretary, Colonel Sir M. Hankey, and an assistant secretary, Major Storr, of the Committee of Imperial Defence.

The functions of the Committee generally are to deal with matters of policy from the point of view of construction and provision of material, for which a certificate as qualified pilot is not necessary.

AIRCRAFT IN ACTION

OFFICIAL INFORMATION

ENGLAND

March 13—*Three German Machines Forced Down*—Yesterday (March 12) there was great aerial activity on both sides. Thirty-two hostile machines were engaged. One was driven down near Lille and a second shot down in our lines. To-day (March 13) another German machine was forced to descend in our lines.

March 15—*Aerial Activity*—Considerable aerial activity. Many combats took place. A determined attack on one of our reconnaissances was driven off. A hostile observation balloon was forced to descend when attacked with bombs.

March 19—*Air Raid on Kent*—War Office statement: Four German seaplanes flew over East Kent to-day (March 19). The first pair appeared over Dover flying at a height of 5,000–6,000 ft., one at 1.57 p.m. and the second at 2.2 p.m. The first dropped six bombs in the harbour and then went north-west, dropping bombs on the town. The other raider, after passing over Dover, appeared over Deal at 2.13 p.m., and dropped several bombs. The second pair appeared over Ramsgate at 2.10 p.m., and dropped bombs on the town. One of this pair went west, and the other north, pursued by a British aeroplane. One bomb is reported to have been dropped on Margate. The second machine appeared over Westgate at 2.20 p.m. Here several of our aeroplanes went up in pursuit. No bombs were dropped on Westgate. The total casualties so far reported are: killed, 3 men, 1 woman, 5 children; injured, 17 men, 5 women, 9 children. As far as can be ascertained 48 bombs were dropped altogether. One bomb fell in the Canadian Hospital at Ramsgate, causing damage but no casualties. Material damage was done to several houses, and some artisans' cottages were wrecked. Flight-Commander Bone, R.N.A.S., in a single-seater aeroplane, pursued one of the German seaplanes 30 miles out to sea, where after an action lasting a quarter of an hour he forced it to descend. The German machine was hit many times and the observer killed.

March 19—*Two Enemy Machines Brought Down*—From General Headquarters: Hostile aeroplanes were again active, and there were

many combats. A hostile machine was brought down in the vicinity of Radinghem. One of our reconnaissances was heavily engaged, but drove off all attacks, and drove down one hostile machine in a damaged condition. All our machines returned safely, having completed their missions.

March 20—*Allied Raid on Zeebrugge*—Admiralty report: In the early hours of this morning (March 20) a combined force of approximately 50 British, French, and Belgian aeroplanes and seaplanes, accompanied by 15 fighting machines, left and attacked the German seaplane station at Zeebrugge and the aerodrome at Houtade, near Zeebrugge. Considerable damage appears to have been done. Machines on an average carried 200 lb. of bombs. All machines returned safely. One Belgian officer is reported seriously wounded. All the British machines were naval.

March 12—*Serious Accident at Amiens*—According to the *Matin* a serious accident occurred on this date at the British Aerodrome of Allonville, near Amiens. A machine carrying pilot and observer had just started on a flight when one of the chassis wheels fell off. Fearing that the machine might be wrecked on attempting to alight, the other aviators tried to attract the attention of the occupants of the aeroplane by rockets and other signals, but without success. Finally, a captain thought it his duty to go up in order to endeavour to warn his colleagues. Unfortunately, in so doing he approached too closely to the other machine with the result that a collision occurred at an altitude of some thousand feet. Both machines crashed to the ground and the three aviators, desperately injured, were taken to a hospital in Amiens.

FRANCE

March 13—*Raid on Conflans*—One of our bombarding air squadrons during a night flight dropped 30 bombs of heavy calibre on the railway station of Conflans. Five outbreaks of fire were noticed. In spite of a violent cannonade all our machines returned safely.

March 13—*Raid on Brioules*—During to-day (March 13) our Army Corps and Battle Air Squadrons displayed remarkable activity in the whole of the Verdun region. A squadron, composed of six aeroplanes, dropped 130 bombs on the strategic station of Brioules, north of

Verdun. Very numerous actions were fought in which the advantage lay indisputably with us. In the course of these actions three German aeroplanes were brought down, one in our lines and the two others in the first German lines. Other aeroplanes were seen falling, but their destruction could not be verified.

(Brieculles is on the railway about 20 miles north of Verdun.)

March 14—Raid on Brieculles—Six aeroplanes of the first bombardment group and five double-engine aeroplanes dropped forty-two heavy shells on the station of Brieculles. Very numerous aerial actions were fought to-day in the region of Verdun. Three German aeroplanes were seen distinctly to have been brought down by our machines in the German lines. One of our aeroplanes, attacked by four enemy machines to the east of Lore, fought them, and succeeded in bringing down one of its adversaries, which fell in the region of Cernay. The French aeroplane returned safely to our lines.

March 18—Raid on Metz—Yesterday (March 17), in spite of the mist and the low clouds, our battle-planes in the region of Verdun made 29 pursuing flights, in which they fought 32 actions. One Fokker appears to have been seriously damaged. Last night (March 17) a group of 17 aeroplanes dropped 54 bombs of heavy calibre, 40 on the station of Conflans and 14 on that of Metz. The bombs attained their mark, and many explosions were noted along the railway lines, while three fires broke out in the station of Metz-Sablons. Although violently bombarded along their entire course our machines returned safely. During an offensive reconnaissance another air squadron dropped ten bombs on the aerodrome of Dieuze and five on the station of Arnaville.

March 19—Enemy Lose Four Machines—In the region of Verdun one of our aeroplanes brought down an enemy machine, which fell in flames into our lines near Montzéville. Five of our double-motor machines bombarded the station of Metz-Sablons, the enemy ammunition depots at Château-Salins, and the aerodrome of Dieuze. Thirty bombs of heavy calibre were dropped during this expedition, of which 20 were dropped on the station at Metz. One of our bombardment squadrons composed of 28 machines dropped 72 bombs on the aviation ground of Habsheim and on the goods station at Mühlhausen. Enemy aeroplanes sent in pursuit of our machines engaged them in an aerial battle, during which one French machine and one German machine brought down each other with their machine-gun fire. Two other German machines fell in flames, and three of our aeroplanes were seriously damaged and had to land on enemy territory. Adjutant Navarre brought down his seventh German aeroplane in the region of Verdun. The enemy machine fell in our lines.

RUSSIA

March 15—German Aeroplane over Friedrichstadt—A German aeroplane flew over the environs of Friedrichstadt and disappeared after being fired on by our artillery.

March 19—Bombs on Torpedo Boats—In the Black Sea our torpedo boats sank near the Bulgarian coast a steamer laden with petrol. They were attacked without success by enemy aeroplanes, which dropped eight bombs. The crew of the steamer were taken on board our torpedo-boats.

MESOPOTAMIA

March 14—British Aeroplane Shot Down—Turkish official: "Felahic sector (east of Kut): One British aeroplane was shot down by our fire. The occupants were killed by the explosion of their own bombs."

March 16—Enemy Aeroplane Shot Down—Turkish official: "One of our aeroplanes attack enemy aeroplanes with machine-gun fire and forced them to fly to Imbros. On the evening of March 14, in the neighbourhood of the landing-stage of Akabah, bombs dropped by an enemy aeroplane all fell into the sea. We shot down an enemy aeroplane two kilometres (?) east of the Suez Canal. The occupants escaped. Otherwise there is nothing new."

[Akabah is at the head of the gulf of that name, in the Red Sea.]

ITALY

March 18—Futile Raid by Enemy Aircraft—Enemy aircraft dropped incendiary bombs in the neighbourhood of Punta Sdobba, in the Gulf of Paizano, without causing any damage.

March 20—Air Raid on Laibach—The official agency has issued the following communiqué, giving a detailed report of the aerial bombardment of Laibach on February 19. The Post Office, Savings Bank, Hotel Stadt, Wien, and Southern Railway Station were struck. In one street alone 40 houses were wrecked, as also were three barracks and the quarters of the commandant. The bombardment lasted four hours. Adelsberg, Oberlaichen, and Opcina were also bombarded.

AUSTRIA

March 15—Bombs on Trieste—Italian aviators dropped bombs on Trieste without, however, causing any damage.

GERMANY

March 13—Three Enemy Machines Destroyed—After considerable reconnoitring activity our airmen have successfully attacked railway buildings and dug-outs, especially on the railway from Clermont to Verdun. Three enemy aeroplanes were destroyed, two in Champagne and one in the Meuse district.

March 14—Five Enemy Machines Brought Down—Lieutenant Immelmann shot down two British aeroplanes, one east of Arras and the other west of Beaumont. The occupants are dead. Lieutenant Boelcke brought down two enemy aeroplanes behind the French line, the first above the fortress of Marre and the second near Malancourt (north-west of Verdun). Both machines were destroyed by our artillery. This was the tenth enemy machine that Lieutenant Immel-

mann had placed hors de combat and the eleventh credited to Lieutenant Boelcke. West of Cambrai a British biplane was forced to descend after an aerial fight, and the occupants were captured.

March 15—More Enemy Machines Brought Down—North of Bapaume Lieutenant Leffers shot down his fourth enemy machine; this was an English biplane. Both near Vimy (north-east of Arras) and in the neighbourhood of Sivry (on the Meuse, north-west of Verdun) a French aeroplane was brought down by our anti-aircraft guns. Over Haumont (north of Verdun) a large French battle-plane fell to earth after an aerial engagement. Its occupants were made prisoners. The occupants of the other machines mentioned are dead.

March 16—Futile Attack on Labry—In an aerial encounter a French aeroplane was shot down south-east of Beine (Champagne). The occupants were incinerated. Enemy aviators last night again made an attack on the German hospital in Labry (east of Conflans). The first attack took place during the night of March 13. No military damage was done. Of the civilian population one woman was seriously injured and one woman and two children slightly injured.

(See French Official)

PROGRESS AT THE FLYING SCHOOLS

The Grahame-White Civilian School—Straights with instructor: Box, Hathaway, Hillaby, Holman, Nadin, Rigby, Smith, Tanner, Timmis, Williams (F.). Circuits with instructor: Butler and Franck. Eights with instructor: Phillipi. Instructors during week: Biard, Hale, Manton, Pashley, Russell, and Winter.

The London and Provincial School—Instructors: W. T. Warren, M. G. Smiles, H. Sykes, C. M. Jacques, and W. T. Warren, jun. Pupils doing rolling: Quayle, Jennings, Creaghan, Aldous, Dawson, Rimer, Ferris, and Archer. Pupils doing straights: Brown, Moore, Hay, de Goussencourt, Vilain. Pupils doing circuits and eights: Clement and Scott. Royal Aero Club Certificates have been taken this week by Carleton E. Clement and W. A. Scott.

The Hall School—The following pupils were out receiving instruction during the past week:—With Instructor Smith: Duncan, Collier, Dickson, Rayne, Mahoney, Glegg, Gudger, Le Grice, Halliday, Rand. With Instructor Smith (for A. Chave, indisposed): Rochford, Smith, Longton, Cosgrave, Neal, Millburn, Chapman, Bennett, Roberts. With Cecil M. Hill: Ormerod, Arnsby, Collins, Lieut. Cooke, Dodd, Thom, Cook, Wooley. Royal Aero Club Certificate taken in excellent style by Gerald Smith. Machines in use: Hall and Caudron high-power tractors.

N.B.—The Hall School beg to announce that they have a vacancy for a good qualified instructor; apply with references to Hall School, Hendon.

HONOURS FOR THE R.N.A.S.

The *London Gazette* of March 14 contained the following List of Honours:—

COMMENDED IN DESPATCHES

The undermentioned officers have been commended for service in action in despatches received from the Vice-Admiral Commanding the Eastern Mediterranean Squadron covering operations between the time of the landing on the Gallipoli Peninsula in April, 1915, and the evacuation in December, 1915—January, 1916:

Wing Capt. Frederick Hugh Sykes, R.N.A.S.
Commander Charles Rumney Samson, D.S.O., R.N. (Wing Commander, R.N.A.S.).
Commander Robert Hamilton Clark-Hall, R.N. (Wing Commander, R.N.A.S.).
Lieut. Cecil John L'Estrange-Malone, R.N. (Squadron Commander, R.N.A.S.).
Lieut. Richard Bell Davies, V.C., D.S.O., R.N. (Wing Commander, R.N.A.S.).
Flight Commander Reginald Lennox George Marix, D.S.O., R.N.A.S.
Lieut. Charles Humphrey Kingsman Edmonds, D.S.O., R.N. (Flight Commander, R.N.A.S.).
Flight Commander Charles Henry Butler, R.N.A.S.
Flight Lieut. George Bentley Dacre, D.S.C., R.N.A.S.
Flight Lieut. Gordon Lindsay Thomson, R.N.A.S.
Flight Lieut. Edward Harris Dunning, R.N.A.S.
Flight Lieut. Gilbert Formby Smylie, D.S.C., R.N.A.S.
Carpenter James John Brownridge, R.N. (Warrant Officer, First Grade, R.N.A.S.).

C.M.G.

Wing Capt. Frederick Hugh Sykes, R.N.A.S.

D.S.C.

Flight Commander Charles Henry Butler, R.N.A.S.

Flight Lieut. Gordon Lindsay Thomson, R.N.A.S.

These two pilots have carried out photographic work, on many occasions flying at low altitudes over the enemy's lines to get good results.

Flight Lieut. Edwin Harris Dunning, R.N.A.S.

Has performed exceptionally good work as a seaplane flyer, making many long flights both for spotting and photographing.

Acting Sub-Lieut. John Edmund Sissmore, R.N.

Acting Sub-Lieut. John Dyson Chapple, R.N.

Midshipman Erskine Knollys Heveningham St. Aubyn, R.N. Have been continuously employed as observation officers in aircraft since April, and performed most valuable services.

The *London Gazette* of March 16 contained the following:—

MILITARY CROSS

Lieut. (Temporary Capt.) Eustace Osborne Grenfell, R.A. and R.F.C.

For conspicuous gallantry and skill. He attacked singlehanded and brought down three Fokker aeroplanes. Capt. Grenfell has shown great bravery and initiative at all times.

DISTINGUISHED CONDUCT MEDAL

2341 Corp. C. H. Nott, No. 15 Squadron, R.F.C.

For conspicuous gallantry on escort duty when acting as gunner. During an attack in the air he was hit in the eye and rendered unconscious, the machine being also considerably shot about, and the engine damaged. On recovering consciousness he at once made use of his gun with such good effect that he drove off the enemy's aeroplane, which had pressed the attack. Without his fine pluck it is almost certain that the machine and personnel would have been lost. This gallant N.C.O. is likely to lose his eye.

CASUALTIES

ROYAL NAVAL AIR SERVICE

Mesopotamia

KILLED

March 17
Abigail, Second Lieut. Edward A., R.M., R.M.A. Anti-Aircraft Brigade.

Johnson, Flight Lieut. Colin, R.N.

SERIOUSLY WOUNDED

March 17
Thorold, Flight Sub-Lieut. Henry K., R.N.

ROYAL FLYING CORPS

KILLED

March 9
Fincham, Second Lieut. G. E. H., R.F.C.
Price, Second Lieut. G., R.F.C.

Second Lieut. George Heygate Fincham, 6th Squadron, R.F.C., was killed in France on March 9, aged 25. He was the second and only surviving son of the late Lieut.-Col. G. H. Fincham, A.O.D., and the late Mrs. W. F. Jameson. At the outbreak of war he was engaged with much success on engineering work in Southern India. He returned to England and applied for a commission in the Royal Flying Corps, and very quickly obtaining his pilot's certificate; he was gazetted as a pilot in June, 1915. He flew over to join his squadron in France in August, 1915, and in February of this year was promoted Flight Commander and posted as captain, though up to the time of his death he had not appeared as such in the *Gazette*. He met with his death during an engagement with a hostile machine while on an observation flight over the enemy lines, when, his observer having been killed, he was himself severely wounded, and, losing consciousness, his machine fell in the British lines.

March 13
Battye, Lieut. C. W., R.F.C.

Lieut. Cyril Wynyard Battye, Royal Flying Corps, who was accidentally killed while flying on March 13, aged 21 years, was the only son of Lieut.-Col. and Mrs. Battye, of Windsor.

UNOFFICIALLY REPORTED KILLED

March 9
Price, Lieut. G., R.E. and R.F.C.

Lieut. Graham Price, who was killed in France on March 9, was the eldest son of Mr. and Mrs. James Price, of Earls-thorpe Road, Sydenham. He was 28 years of age, and on the outbreak of war joined as a motor cyclist dispatch-rider and went out to France in September, 1914, remaining there in that capacity until November last, when he was granted a commission in the Royal Engineers, being attached to the Royal Flying Corps. He quickly obtained his "observer's" certificate, and during this period had many successful encounters with hostile aeroplanes.

The following notice appeared in the *Times* of March 15:—

BROWNE—Previously reported missing, now reported killed in action in France on December 5, 1915, Lieut. Arthur Richard Howe Browne, Royal Flying Corps, only son of the late Arthur R. Browne and Mrs. B. H. Wilbraham, and grandson of Lord Richard Howe Browne.

CORRECTION

Braddyll, Lieut. E. C., 10th Lancers, attached R.F.C., previously unofficially reported killed, now officially reported died as prisoner of war, should read: Previously unofficially reported killed, now officially reported died.

Saunders, Lieut. R. A., R.F.A., 7th London Brigade (T.F.) and R.F.C.

Lieut. Reginald Arthur Saunders, 7th London Brigade, R.F.A. (T.F.), temporary Flight Commander, Royal Flying Corps, was killed in a fight in the air in France on March 14.

He was second son of Mr. and Mrs. Arthur Saunders, of 10, Regent's Park Road, N.W. He was 22 years old.

WOUNDED

March 7

Williamson, 5520, Second Class Air Mech. W., R.F.C.

March 9

Twisleton-Wykeham-Fiennes, Capt. Hon. L. J. E., 4th (T.F.) Oxfordshire and Buckinghamshire Light Infantry and R.F.C.

Wilson, Second Lieut. H. D. W., R.F.C.

March 12

Egerton, Capt. R., Royal Irish Fusiliers and R.F.C.

Lerwill, Lieut. F. W. H., R.F.C.

Phillips, Second Lieut. M. G. P., South Lancashire Regt. and R.F.C.

PREVIOUSLY REPORTED WOUNDED, NOW REPORTED DIED OF WOUNDS

March 1

Scrubby, Second Class Air Mech. H. H., R.F.C.

MISSING

Turner, Second Lieut. R. P., R.F.C.

March 10

Gayford, Second Lieut. D. B., 3rd Bn. Royal West Surrey Regt., attached R.F.C.

Heywood, Second Lieut. L. R., R.E. and R.F.C.

Mediterranean Force

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED, NOW REPORTED KILLED

Ledger, Second Lieut. H. M. C., attached French Seaplane Flight.

Mesopotamia

MISSING, BELIEVED KILLED

Palmer, Capt. W. G., 113th Infantry, attached R.F.C.

INQUEST ON CAPT. G. C. NICHOLSON, R.F.C.

At the inquest held on March 13 on the above officer and his passenger, Mechanic James Hubert Martin, Capt. Swart, R.F.C., stated that on Saturday afternoon (March 11) Capt. Nicholson left for a flight, and when the machine was about 4,000 ft. up he observed it beginning to take an "S" turn downwards. When within 250 ft. of the ground it made a steep "bank" of 60 degrees. The speed was not sufficient to overcome the banking, which developed into a side-slip, and finally into a nose-dive. Surgeon J. N. Glenn, R.N., was at once in attendance, but Capt. Nicholson died on the way to hospital and Martin fifteen minutes after admission. Verdicts of accidental death were recorded.

(The death of Capt. Nicholson was reported in our issue of March 15.)

THREE FATAL ACCIDENTS

While flying on the east coast of Scotland on March 17 Flight Lieutenants Johnstone and Baumont lost their lives owing to a mishap to the mechanism of their biplane. The accident occurred at a height of about 100 ft., and both men were found dead beneath the biplane, which was partially wrecked.

A young airman named John Ritchie Laidlaw, of New Zealand, a pupil at the Ruffy-Baumann Aviation School at the London Aerodrome Hendon, was also killed on March 17. It is believed that he banked too steeply and side-slipped from a height of 200 ft. Both legs were broken, and death was instantaneous. Mr. Laidlaw was the son of Mr. Robert Laidlaw, of Auckland, N.Z.

FATHER AND SON IN AIR ACCIDENT

An inquest was held on March 16 on the body of Mr. Matthew Muir, of Finchley, who was killed in an aeroplane accident near Ilford on March 12, reported in our issue of March 15.

Corporal Courtney, of the Royal Flying Corps, said he tested the machine before Mr. Muir and his son, Lieutenant Kirkpatrick Muir, entered it. The witness thought the accident might have been due to an error of judgment, or it was possible that the pilot was temporarily overcome by faintness. Lieutenant Muir was seriously injured. A verdict of "Accidental death" was returned.

APPOINTMENTS

ROYAL NAVAL AIR SERVICE

Acting Lieut.-Commander:

R. B. Ward, to President, for R.N.A.S.: March 17.

Flight Sub-Lieuts:

T. G. Vernon, promoted to Flight-Lieut., and B. C. Windeler (temporary and acting), promoted to Flight Lieut. (temporary), both with seniority of January 1.

The following Sub-Lieuts. have been graded as Flight Sub-Lieuts. with seniority as stated:

W. F. Horner, A. Mylne, R. A. Cochrane, R. S. Booth, and G. M. Thomas: March 17, 1915.

J. B. C. Hamilton: April 30, 1915.

T. P. Y. Moore: May 13, 1915.

P. E. Maitland, P. G. N. Ommaney, W. Underhill, C. W. C. Browne, C. B. C. Swayne, W. Y. La R. Beverley, A. H. Wann, T. W. Elmhirst, W. P. C. Chambers, I. C. Little, and J. A. Barron: May 15, 1915.

F. L. C. Butcher and E. K. H. Turnour: September 15, 1915.

The following Acting Sub-Lieuts. have been graded as Flight Sub-Lieuts., with seniority as stated:

- H. S. Scroggs and E. F. Turner: September 15, 1915.
 A. L. White: December 18, 1915.
 H. D. Graham, D. Don, R. S. Sugden, R. S. Montagu, and A. G. McEwan: January 15.
 A. Frauenfelder, entered as Probationary Flight Sub-Lieut. (temporary), with seniority of March 17, and appointed to *President*, for R.N.A.S.
 A. E. Courage and H. E. Gillman, both entered as temporary Sub-Lieuts. (R.N.V.R.), with seniority respectively of March 10 and March 11, and appointed to *President*, additional, for R.N.A.S.
 Rene Bull, granted temporary commission as Lieut. (R.N.V.R.), with seniority of March 13, and appointed to *President*, additional, for R.N.A.S.
 C. R. H. Stewart and P. C. C. Passman, both entered as Probationary Flight Sub-Lieuts. (temporary), with seniority of February 16, and appointed to *President*, additional, for R.N.A.S.: February 23.
 C. R. Evershed, granted a temporary commission as Sub-Lieut. (R.N.V.R.), with seniority of March 5, and appointed to *President*, additional, for R.N.A.S.
 H. B. Leach, granted a temporary commission as Lieut. (R.N.V.R.), with seniority of March 16, and appointed to *President*, additional, for R.N.A.S.

ROYAL FLYING CORPS

Flight Commanders, from Flying Officers, and to be Temporary Capts. whilst so employed:

- Second Lieut. G. E. H. Fincham, Special Reserve (since killed in action), and Second Lieut. W. V. Strugnell, Hampshire Regt.: February 12.
 Lieut. K. D. P. Murray, Special Reserve, Temporary Second Lieut. M. H. B. Nethersole, General List, and Second Lieut. G. H. B. McCall, Special Reserve: March 1.

Flying Officers:

- Lieut. the Hon. J. H. B. Rodney, Rifle Brigade, Special Reserve, and to be seconded; Second Lieut. F. N. Grimwade, Special Reserve; Second Lieut. E. Page, Middlesex Regt., and to be seconded; Second Lieut. R. J. Hudson, Royal Fusiliers, and to be seconded; Capt. K. E. Kennedy, Canadian Artillery, from a Flying Officer (Observer); Temporary Second Lieut. J. K. Summers, General List, from a Flying Officer (Observer): February 29.

Assistant Equipment Officers:

- Second Lieut. George A. Hilliar, Gloucestershire Regt., and to be seconded: February 13.
 Temporary Second Lieut. C. H. E. Ridpath, General List: February 26.
 Second Lieut. S. G. Frost, Special Reserve: March 1.
 Second Lieut. E. Graham, Special Reserve: March 2.

Second Lieut. to be Lieut.:

- E. H. Grant, Argyll and Sutherland Highlanders (June 21, 1915, and to be seconded for service with R.F.C. from January 21, 1916).

To be Temporary Second Lieuts.:

- Pte. P. T. Carden, from Royal Fusiliers: February 4.
 Corp. R. Ferguson, from R.F.C., and First Class Air Mech. R. Cook, from R.F.C.: Feb. 20.
 Bombr. K. K. Turner, from Australian Imperial Force: March 1.
 William H. Tinsley: March 4.
 Pte. Eisdell B. Morgan, from a Reserve Bn., Royal Fusiliers (City of London Regt.); Pte. J. Blackwood, from London Regt., T.F.; Bombr. J. K. Grayson, from University of London O.T.C.; Pte. D. Sinclair, from University of London O.T.C.: March 13.
 Pte. John W. R. Elphinstone, from Inns of Court O.T.C.: March 15.

SPECIAL RESERVE

Second Lieuts. (on probation) confirmed in their rank:

- Sydney G. Frost, J. F. Luscombe, K. C. Cleaver, E. B. Horlick, Geoffrey C. Burnand, Bertie F. Crane, Arthur H. L. Beale, Stanley Whitechurch, Fortescue Hitchins, W. H. Tolhurst, H. J. N. Drope, E. Duveen, M. V. Morgan.

To be Second Lieuts. (on probation):

- J. MacD. Patten, T. Worswick, H. Wing, Leslie Bawn, L. H. B. Cosway, and E. Cooke: February 21.
 R. G. Cookson: February 29.
 R. M. J. Dunphy: March 6.
 Cecil Kerr, Hubert F. Fisher, James A. Brown, Henry D. Crompton, Clifford H. Kitchen, Edward C. L. Killen, Christopher J. Hallward, R. Holloway, C. M. Denny, J. J. Bland: March 13.
 D. W. Hardy: March 16.
 The Christian names of Second Lieut. Beaufoi John Warwick Montessor Moore are as now described and not as in *Gazette* of September 8 and October 28.

LEGAL NEWS

MR. GRAHAME-WHITE SUMMONED

Mr. Claude Grahame-White was summoned at Dorking on March 18 for exceeding the motor speed limit. Mr. Firth, defending solicitor, refused to produce his client's licence, and the case was adjourned for the police to prove alleged previous convictions.

PRISON FOR R.F.C. PRIVATE

Before Sir John Dickinson at Bow Street on March 18, the hearing was resumed of the case in which Frank Kleeman, 20, a private in the Royal Flying Corps, was charged with refusing to give certain information to Sidney John Field, an inspector under the Trading With the Enemy Act, with respect to the business of Bergmann, Kleeman and Co., Ltd. Prisoner's father was alleged to be of German origin, but prisoner himself believed that he was naturalised. When arrested prisoner said that he had assisted Mr. Field as much as he possibly could until he exasperated him. Prisoner, who pleaded guilty, was sent to gaol for three months.

AIR DEFENCE OF LONDON

Lord French, Commander-in-Chief of the Home Forces, on March 17, at the Horse Guards, received a deputation of London Mayors regarding the question of air defence. The deputation was headed by the Mayor of Holborn, and a general consultation took place on methods of protecting the general public in case of raids. The proceedings were private.

The Mayor of Holborn afterwards informed a Press representative that Lord French was quite sympathetic, but thought that the local authorities ought themselves to say what warnings were required. He (the Mayor) explained that there was no unanimity among the Mayors on the subject, as some were in favour of warnings and some of only a limited warning, and that it would be impossible to get any agreement between them.

The Mayor of Holborn suggested that the following simple methods of warning should be adopted:—

1. The police to give notice to theatres and other places of amusement.
2. The London newspapers to have an intimation so that it might be put on the posters.
3. Red lamps to be put up at certain fixed points to be lit by the police or the municipal authority.

PATENT INFORMATION

This list is specially compiled for AERONAUTICS by Messrs. Rayner and Co., Registered Patent Agents, of 5, Chancery Lane, London, from whom all information relating to Patents, Designs, Trade Marks, etc., can be obtained gratuitously.

LATEST PATENT APPLICATIONS

- 3,139 Ackermann, A. S. E. Method of constructing and operating doors, etc., for aircraft hangars. 2/3/16.
 2,930 N. L. Caldwell. Elevating and sustaining mechanism for flying machines. 28/3/16.
 3,166 H. M. Dowsett. Aeroplanes. 2/3/16.
 3,287 W. Motteshead. Aeroplanes. 4/3/16.
 3,205 W. Wintle. Airships. 3/3/16.

SPECIFICATIONS ACCEPTED

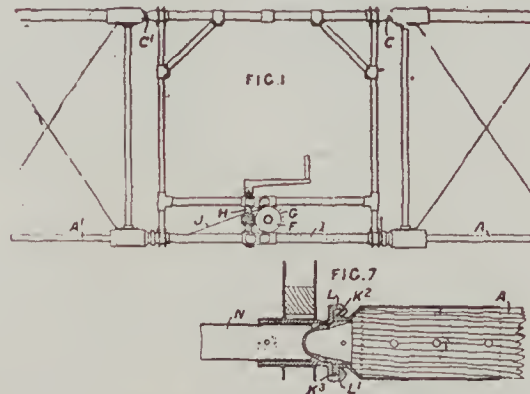
- 13,674 Royce, and Rolls-Royce, Ltd. Aircraft propellers.

SPECIFICATIONS PUBLISHED THIS WEEK

- 9,931 Gigot and Freeman. Flying machines.

LATEST PUBLISHED ABSTRACT

- 22,440 "Aeronautics." Sopwith Aviation Co., Kingston-on-Thames. In aeroplanes having wings which can be folded backwards into a position parallel to the body of the machine to reduce the bulk, the wings are pivoted at C, C¹, and the operating cords I, I are wound on a drum F rotated by worm gear G, H. The spars A, A¹ are fitted



with a head having flanges K², K³, which enter a socket having overhanging lips L, L¹. By the rotation of the socket through an angle of 90 degrees, the lips engage the flanges, and the wing is secured in the extended position. The sockets of the upper and lower wings are secured to rods N, which are connected by links so that the whole of wings may be locked or released simultaneously.

Printed copies of the published specifications and abstract can be obtained from Messrs. Rayner and Co. at the price of 1s.

AERONAUTICS

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(FOUNDED 1907)

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ONE PENNY

PRICKING A BUBBLE

IT is one of the gravest faults of the constitution of modern society that it takes a man at his own valuation. One need only speak loudly enough, bray blatantly and insistently enough, write a sufficient number of articles for the daily and childishly unsuspicious Press, in order to be hailed as a god-given expert—save only by those in the know, and unfortunately their tongues are mostly tied. Mostly, but not all. At the Royal Institution there was lately exhibited a soap-bubble—a most remarkable bubble, for it lived for full five weeks. Then suddenly, without visible cause, it collapsed utterly and vanished for all eternity. No doubt it was an expert bubble, else it would not have lived so long and commanded such attention; nevertheless it was a bubble, and owing to its essentially bubbly nature it succumbed to the fate that in the long run overtakes all bubbles. It disappeared, and where during the space of its brief but news-compelling life it had shone with iridescence there was left—nothing.

Mr. Billing was sent to Parliament as their representative by the sturdy electors of East Hertfordshire because they deemed him, taking him at his own valuation, as an expert in matters relating to aerial navigation, as the one man capable of reforming the Air Services and preserving our shores once and for all from aerial attack. To continue the simile, Mr. Billing blew forth an air bubble and exhibited it to the gaze of an admiring and trusting public. But his bubble bids fair to share the fate of all other bubbles, and ere long collapse owing to its inherently unstable nature.

Mr. Billing was returned to Parliament for the express purpose—leaving the liquor interest aside—of setting our aerial house in order. He posed and was generally accepted as an expert in these matters. He had seen, so he said, from within the defective working and the maladministration of the Air Service, and, moved by the prevailing abuses, had determined to resign and to devote his energies to the aerial salvation of the country by entering the House of Commons. Above all, he was a practical airman and an aeroplane designer. On the face of it, what better qualifications could anyone possess to be deemed an expert; who more competent to protect the worthy electors of East Herts and their innocent homesteads from nefarious attack by air?

It has been our studious endeavour since the very beginning of our career, which, by the way, considerably antedates Mr. Billing's abortive journalistic venture, to refrain from personalities. Our sole concern is the welfare of the aeronautical industry in particular and of the country at large. But when a man gifted with sufficient assurance is fain to constitute himself the representative in Parliament of the aerial welfare of his country, when he signals his début by a personal attack as ill-mannered as it was unwarranted upon the technical advisers of His Majesty's Government, men whose careers have been both distinguished and blameless in their respective spheres, who,

moreover, have been content to continue to fulfil their arduous and often thankless task in their country's service, and thereby deprived themselves of the power of reply and of self-defence, then it becomes our duty to examine publicly the claims to recognition as an authority of this latest political recruit.

First, as to Mr. Billing's claim to be a practical aviator. The true facts of the case are these: One morning at Brooklands, for a bet, Mr. Billing succeeded in passing the childishly simple tests required to obtain a pilot's certificate, a feat which could be accomplished by any averagely intelligent and active schoolboy, and makes a man a practical aviator as much as the possession of a driver's licence vouches for the competency of anyone to drive a motor-car. In this respect, as a matter of fact, Major-General Sir David Henderson is far better qualified to speak than Mr. Billing, for Sir David has not only had a far more extensive flying career, but has had personal acquaintance of the conditions prevailing at the front, while possessing a knowledge of strategy which Mr. Billing wholly lacks. And if Mr. Billing adds to his qualities of brilliant airmanship—the word is used advisedly—the wonderful capacity for organisation with which he is credited by his supporters, why is it that he has never flown on active service or been connected with the active side of the Air Service at the front, but confined his energies to running a mobile anti-aircraft battery along a certain portion of our coasts and to serving for a while in the capacity of an organisation and transport officer in France? What, again, are his qualifications to pose as an expert aeroplane designer and constructor? The industry knows well enough, but where is the Supermarine?

Moreover, Mr. Billing, though at one time a member of the Royal Naval Air Service, was never on the Admiralty Staff, and has, therefore, never been in a position to know anything about the organisation or administration of the Air Service. Whence, then, does he derive his so-called facts?

That all is well with the Air Services, their constitution and administration, we should be the last to assert, and our files bear witness to the fact. But we have every right, and will insist upon it to the bitter end, to resist to the uttermost the slur cast upon the industry and the accusation that it has supplied to our pilots at the front machines which this self-constituted critic stigmatises as "Fokker fodder," and the insult levelled at the members of the so-called Derby Committee, who, whatever their other failings, are at any rate officers and gentlemen who perforce remain silent. An unjust taunt—especially when it is in particularly bad taste—has an awkward knack of recoiling upon the head of its originator; and when Mr. Billing has the effrontery to term a distinguished officer such as Sir David Henderson "the de Rougemont of the Air Services," it would be well for him to ponder over the old English proverb which runs to the effect that those who live in glass houses should not cast stones.

AERO ENGINE DESIGN

THERE can be little question that the motive-power—of that type which has been concisely called an “aero-motor” for want of a better word—will be, for some considerable time, as it has always been hitherto, the most important factor in mechanical flight. Our most advertised inventor of “notions” always averred that it was solely the lack of an internal combustion motor that prevented his one and only machine from flying years before Santos-Dumont, Igo Etrich and his compatriots, the Wright Brothers, had even fluttered upon theirs. Albeit anyone who ever saw it would be quite certain it never could have flown except by grace of a far greater miracle than any motor is. Some of us, it is true, do foresee a period—hoping and believing it to be rapidly approaching—when experience and invention will be concentrated upon improving all and sundry aeroplane efficiencies on the working basis of the best motors then available. But even so, the motor will never be less than an equal factor in the equation of flight, so long as heavier-than-air declines levitation. The aeroplane may well not be the last word in flying machines; probably represents quite a limited stage in their development; but whatever shape it may come to take in later stages, the motive power must retain its paramount importance in the scheme.

My own belief is that that motive power itself will be the ammonia gas turbine, when once the possibilities of that little-exploited type of prime mover come to be appreciated; and the concrete example thereof—even one-half so good as the Wainwright-Brown, completed yet wholly neglected these five years—shall be duly capitalised. And not the internal-combustion motor at all!

Then there is that marvellously ductile and economical force-medium white-hot steam, flush-boiler generated. Not necessarily the vapour of water, either. External combustion, then, with all its prospective difficulties, almost disabilities, aloft? These troubles exist, admittedly, but, being mechanical chiefly, exist to be overcome. Yet again, it is not necessarily a case of external combustion. For those few, who, discarding the shackles of professional text-books—full of merely recorded observations of accidental and circumstantial results which the professional mind has mistaken for essentials and crystallised into “laws”—have learned to think for themselves essentially in the fundamental terms of British thermal units, there are perfectly legitimate possibilities of heat generation and fluid expansions without external, or indeed without any combustion at all! For those of less fortunate experience and mental habit, it suffices to say that the thing can not only be done, but has been done. So definitely too, and beyond denial, that one can afford to say that the expenditure along this avenue of £5,000—a millionth fraction of our present daily average—would not only help to finish up this war, but give us once and for all the command of the air, thus mostly ending all war. *J'en ai bien vu, moi qui vous parle.*

Who knows, too, what curious gases there may be, of which the cycle, like Fleury's of “The Night Mail,” may not be turned to useful—and indefinitely available—work; what forces for aerial locomotion someone may not likewise turn to the account of civilisation any Monday morning. To this conclusion—at least in the former case—one is compelled, regarding the known physical quality of ammonia alone, whereby a mere 100° F.—a shade above normal, hardly feverish—gives an expansion and therefore pressure, and hence again work equivalent to water vapour at the very respectable superheat of 700° F. It is just as well to consider these things with the eye of faith before taking the word of any of the be-lettered drawing-room sages of Victoria Street, S.W., that any proposition of the kind is “impossible,” to use their favourite stupidity.

However, these prophetic speculations do not create their subjects for our present need and use. Limited to a degree, finite to disgust as the internal-combustion motor may be, it is here to hand with but half its possibilities unused, until the two-stroker has rendered the four-stroker out of date;

or again until we have beheld the performance of at least one turbine, now in the making, actually, which gives *two working strokes per shaft revolution per unit*; and that over a range of 210 degrees, or just 30 degrees beyond the limit of any crank stroke. Quite a few days yet, you see, before oil shares become a dull market because nobody uses petrol.

Thus the practical immediate consideration may well be the present range of types of commercially listed and conscripted aeromotors, rotary and radial, vertical and V, without forgetting the too-much neglected horizontal opposed type. Last and first I put this one and the rotary, since both were the pioneers. It was a horizontally opposed two-cylinder Duthiel-Chalmers motor, one remembers, that was fitted to Santos-Dumont's earliest Demoiselle; another like it, by Clement, that was seen on the Clement-Bayard papillon monoplane some two years later; and a similar but larger Nieuport that enabled Weymann to win the Gordon-Bennett Cup at Eastchurch from the third circuit to the finish. The type, as a marine motor—the true genesis of the successful aeromotor—was not only indicated but extensively manufactured years ago by Claude Sintz, of New York, one of the soundest yet most original engineers in a country which has hitherto mostly relied upon copyists, motor-fakers, and imported French motor-car draughtsmen for its motors of all kinds, to the exclusion of more genuine native talent. More than one French marine motor manufacturer used it consistently, with much practical success but few sales, as Monaco triumphs with fast-running but utterly unsuitable car-motors had captured the popular imagination. So much so that, with the exception of a few combinations such as Panhard and Alphonse Tellier, Dalifol, and the yards adjacent to the Ile de la Jatte, the French motor-boat industry went wild and finally vanished into the very cold night that preceded the dawn of French aviation.

But to-day, in spite of the apparent inability of British motor designers to understand the little special details that make all the difference between the success or the failure of this type, it seems to me that one of all others—with four or six cylinders a-side, of course—is most called for. For what is the chief requirement—shriller daily—of the *avion*, the huge yet highly-spiced warplane of to-day and many to-morrows, but high power, and no mere 200 h.p. at that? The experiment of placing two or more motors or catherine-wheels to port and starboard, anywhere between the planes where they seem likely to fit, was always hopeless, and is a proved failure to-day from even the mecano standpoint, for so placed you cannot control, much less synchronise, them. From the pilot's point of view it was no less deadly. For even supposing such motors to be nacelle-housed, you divided your head-resistance into three instead of uniting it and so modifying it. For landing—which is ninety-nine hundredths of flying—you dispersed your weight instead of concentrating it. On the other hand, what is the matter with a single great power unit? Many things, not of its unity, but its greatness, may be alleged with much apparent reason. You may have—almost necessarily would have—your clutch and short transmission shaft; the latter connecting up to some sort of right and left hand driving gear-boxed device. But even so, through what spur or herring-bone gearing are you going to put 300 h.p. or more, up to 400 h.p. and then some perhaps? The chain, too, that is going to take its half of that power—especially on a reversed pull—will need to be some chain.

Here, however, it occurs that one form of worm-drive might fill the breach of mechanical desirability well enough. What would be wrong, for instance, with a single transmission shaft with two Lanchester-type worms on its end, undershot to two diagonally-mounted worm wheels; these again rotating shafting diagonally right and left, up to worm wheels behind the propellers, undershot in one case, overshot in the other, by worm-drives on the shafting? In my ignorance I want to know.

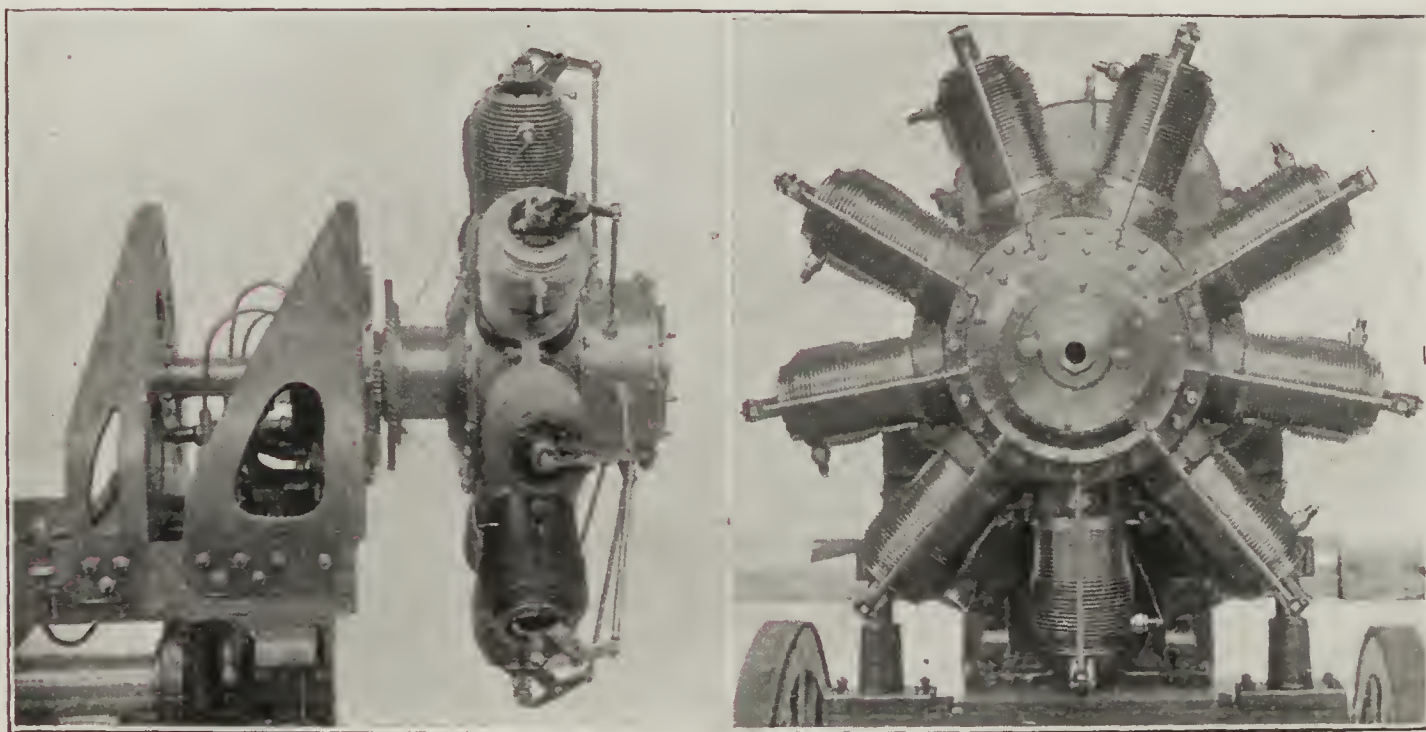
Yet even so, assuming the success of such a drive, what

a motor? Quite so, but how essential, as we have seen, to have it as a unit. It will be a good six feet overall length necessarily. Therefore it will throw a great deal of weight very far forward that can only be balanced by carrying as much very far aft. Too far, in fact, for the crew to be of much use, because too far to give them any freedom of movement fore and aft. And a c.g. travel path of the enormous length of twelve feet at least minimum inevitable. What a potential spinner and nose-diver; what a labouring brute to climb; and, in fine, what a probable death-trap, incidentally. And as a V type, not a motor to be reached over, or shot over, in any case.

Out of which general impasse the horizontal opposed type seems to lead us gently and assuredly to the happy ending of all good and true stories. With its twelve cylinders, six on each side, it may well be six feet long. But as there is nothing to prevent it being covered by light metal floor-plates, and walked over, five of its six feet of its length, if not the whole, may be set back to amidships directly under and between the planes. Correspondingly the crew space may be brought forward. And it will be an effective crew

charge wire-drawing. Therefore—quite apart from any question of better balanced reciprocating parts, every whit as good as in a V—one might have altogether looser-fitting pistons. Worth while, surely, for the sake of the extra aeromotor reliability directly engendered thereby, according to all the experience of the great pioneer houses of Panhard, de Dion, and Renault. No such convincing argument as the appeal to the Fathers of the Church, is there? No fear of cylinder ovalising either, with the crank-shaft axis offset an inch downwards.

Again, in the important matter of the petrol tanks and their protected installation. After this fashion, what is to hinder the housing and insulation of two of them, as much as six feet long—albeit internally bulkheaded to break the wash—inside the bulging round of this fattest, widest part of the fuselage? where, incidentally, they would add nothing to the general head-resistance of the machine, thereby adding considerably to its efficiency. Withal, the entire motor should be just as accessible, every part of it, if properly designed in detail; even more so than usual, for the mechanic would only have to lift the cockpit floor plates. On the



TWO VIEWS OF A 100 H.P. MONO SOUPAPE GNOME, BUILT BY MESSRS. PETER HOOKER, OF WALTHAMSTOW, FOR THE GOVERNMENT

space, for the crew will be free to move about over the whole length of the c.g. travel-path, thus reduced to about six or seven feet maximum. And your big warplane, like a boat ballasted well within her middle third or less, will be lively and handy, turning quick on her helm, but never drifting out; and because never hunting, nose after tail, never tending to spin and nose-dive. Likewise, because of all these things, a rapid climber, other conditions being favourable to that result. Notice, too, what further installation advantages become readily possible with a motor of this kind. You would have your big motor-car type of radiator, medallion-shaped or bull-nosed, forming the actual bow of the fuselage; and your observer or gunner would be able to walk right up to it without affecting the general stability, and use his glasses or his gun effectively. The water circulation, too, would be better carried out with less strain on the pump, which might be geared to run anything from 20 to 40 per cent. slower, if indeed thermo-syphonic circulation did not suffice, and suit the working conditions better, as I believe it would. The two carburetters—one for either cylinder battery—could be mounted high on either side in the bulge of the fuselage, accessible, yet out of the gangway. An even petrol and mixture feed would be better assured because the latter heavy fluid merely has to fall into the motor, instead of—did it ever strike you?—climbing against its own inertia, by dint of strenuous piston-suction and

whole, then, what about reviving the horizontally opposed motor, multiplied four or six-fold, for our big warplanes, the fighting cruisers we chiefly need? especially since such an idea would never occur to the Teutonic copyist.

Incidentally, it will occur to you that if the proposition is convincing for a four-stroke motor from nearly every standpoint of aeroplane mechanics, it should be twice as much so for a two-stroker; valveless—except that its own pistons and gas-passages constitute the valves—and so leaving nothing much that need be got at.

So much for the prospective. For the only too frequent actuality, there is the rotary type, and its congener—in one sense only, that of shape and installation space—the radial. Now it is not too much to say, as a tribute of gratitude—much as you thank the family solicitor before damning his costs—that without these two—especially the Gnome at first, the two or three little horizontals, and to a far less degree the Antoinette—there could have been little aviation at all, and at any rate few, if any, monoplanes for years after that type of aeroplane actually established its vogue. And for the same reason as I have already dwelt upon, length of c.g. travel, limited so far as the motor is concerned to a bare seven inches in either case at first, and now, even with eighteen or twenty cylinders, not more than fifteen inches or so. Within that length, at any rate, 60 h.p. or even 50 h.p. for you, no matter where you made your desperate guess at

the relative positions of centres of pressure and lifting effect. You wrestled with these blind factors and a providence—duly watchful of other than the merely drunken, who would be sober some time—and staggered aloft in a flat calm somehow, to the dizzy height of a hundred feet or so, specially delighting the multitude outside the fences, in biplanes and monoplanes by the score, which every day you broke up cheerfully, like so many polo sticks, before breaking one or more of the twenty kinds of record then manufactured for your encouragement. You flew at any rate—as but for these faithful kobolds you could never have done—or you could be photographed as just about to fly. So you did not mind. If the motor did cost about four times as much as the rest of the machine that was only a sordid detail, solely grievous to the maker and your other creditors. And, as I say, you flew better and better daily. Considering all things, chiefly that you had ten times as much courage and hope as most men, and a hundred times more of both than of money; that you had first to make the machine fly and keep it flying, and teach yourself how to fly at the same time, you were a truly

the rotary-motored Blériot and Nieuport, Farman and Voisin types, the true ancestors of most of to-day's monoplanes and biplanes?

If there be nothing in my contentions, no relation whatever between this c.g. path-length and the type and position of the motor, how is it that they place V-types and verticals alike nearly in mid-plane in all pusher biplanes; and, even so, must carry the nacelle well forward of the rest of the machine? Why must nearly all tractors with these types of motors have their planes so staggered and their line load so far aft? Are any of them notably fast climbers or remarkable for stability? And why are those tabloids—albeit staggered as much or more, and for quite another reason—which are so notably speedy, both in climbing and in straightway flight, and so compact lengthwise, invariably fitted with rotaries or radials, when, if mere power were the only consideration, it would not be difficult, much less impossible, to fit them with V-type motors just as powerful? Bless you, I do not know. I may be talking nonsense. That is why I am asking you.



A GROUP OF 140 H.P. EIGHT-CYLINDER V-TYPE STURTEVANT AERONAUTICAL MOTORS READY FOR FINAL INSPECTION.

wonderful person, an emperor to ten thousand quirks of the war-time crop.

At the same time you may have observed that only about half a dozen pilots were ever able to fly—and survive the experience—that studiously designed and efficient death-trap, the Antoinette monoplane, with its excellent V-type eight-cylinder motor. Whether any of them are alive to-day is more than I am able to say. But you may also have noticed—by way of incidental corroboration of my c.g. path observations—that while you were able, with your rotary or radial motor, to be seated more or less between your planes and see whither you were flying, they were compelled to sit nearly two feet abaft the trailing edges. Undeniably the Antoinette could and did fly successfully—and in quite a breeze—when most others were unable to leave ground at all. No less assuredly, its motor was not only trustworthy, but from its type and marine development was probably longer-lived than any of its time, certainly than any rotary proposition. [With which we entirely disagree.—Ed.]

Yet if you remarked the awesomeness of the Antoinette banking, the huge circle it required to turn at all, its slowness in climbing, its readiness to stall from the least *cabré* flying, and its deadly, irrecoverable plunge when once it began to dive—did it occur to you that there might be some connection between these things and the position of the motor, due more or less to its type? Or, failing any such conclusion, how do you account for the utter disappearance of the Antoinette and its copies—nearly all of which could fly—as compared with

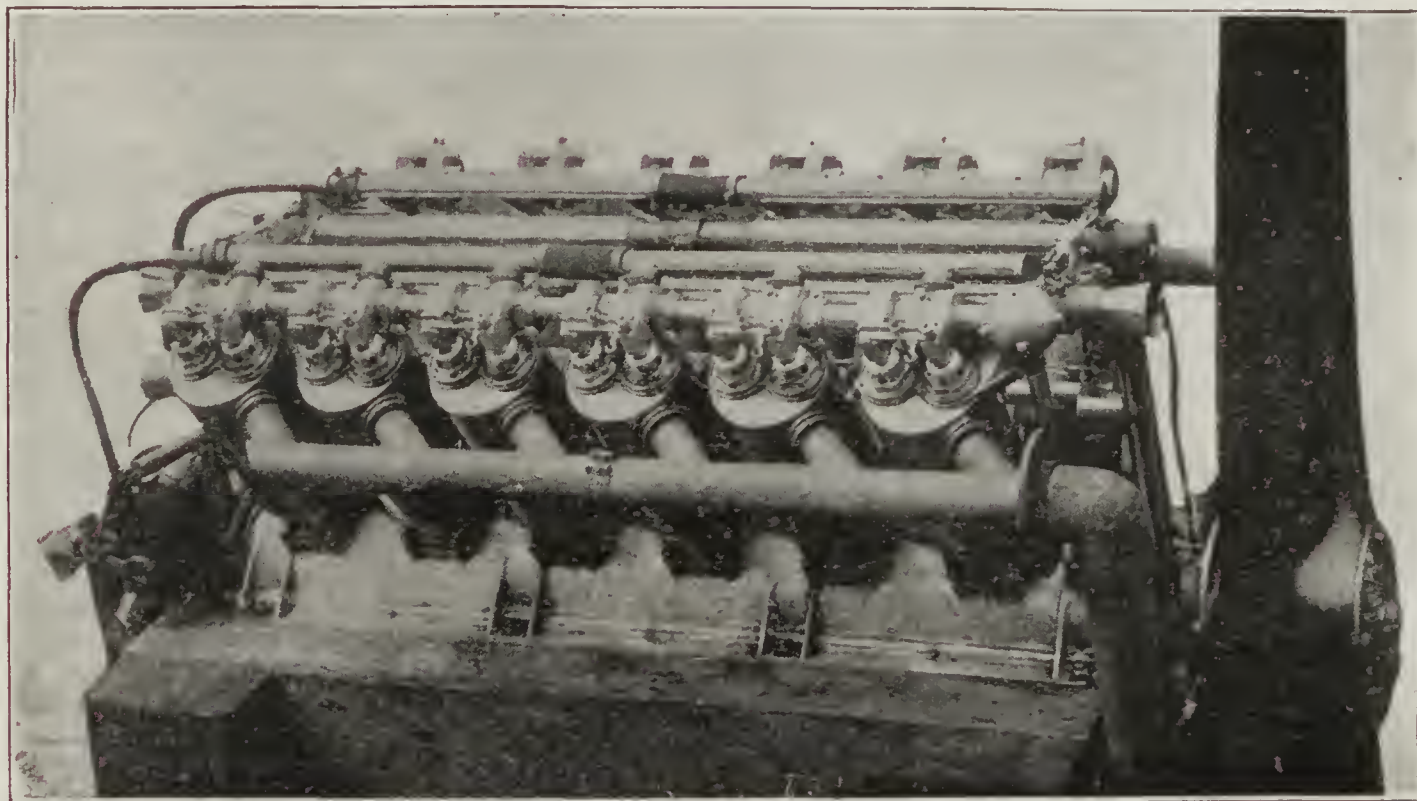
So much for the debt we owe to the Brothers Seguin and Anzani originally, and others since working in the same—and so far allied—rotary and radial paths. For the rest, regarded purely as a motor, a mechanical entity which is supposed to give you so much horse-power for so many pence worth of petrol and oil, continuously under all conditions—an engineer should have no other criterion—one cannot conscientiously say much in favour of the rotary. Consumption apart—which is no small part of aeroplane effectiveness—although its actually piston-swept cylinder volume should promise power, I question whether you get it in anything like the P.L.A.N. ratio you might rely upon from quite an ordinary stationary cylindered motor of similar measurements. If you could, why that apparently unavoidable multiplication of cylinders to eighteen, twenty, or more, since, from the type of the motor alone, it can hardly be a question of torque improvement after the first six or seven? I admit that these motors run, and reliably enough. But how many flying hours have they of life? Hours, mark you, when you consider that in certain V-types—such as the Green—the actual life limit has not been found after months—added up in hours—of thrashing aloft.

With the radial type of motor, then, we have a different story at once. It is nothing more than a highly convenient arrangement of stationary cylinders, with apparently every physical and mechanical attribute that goes therewith. Highly convenient and, furthermore, appropriate for certain purposes of aeroplane design, and within certain power

limits. Place it forward or aft, for tractor screw or propeller, you have just the same effective useful load and passenger space, and that not stinted in its degree. Nevertheless, the power limit does seem to arrive at about 200 to 250 effective in this way. You cannot conveniently get more than nine cylinders in a series working upon one crank, or set upon one crank chamber of convenient transverse diameter. Imagine a third series, and then—albeit that crank chamber might not be unduly lengthened—think of the problems of balance that would be created. Imagine the frightful multiplicity of mechanism arising out of a total of twenty-seven cylinders. Last of all, consider the one factor which finally decides—go into two-stroke practice if you desire enlightenment on this point—the magneto and its maximum firing capacity. Dividing the very moderate speed of 1,000 r.p.m. by 2, for the four-stroke cycle, and then multiply your 500 by 27. Just 13,500 sparks somewhere in a minute! Divide the work by 2 and still find a 6,700 impossibility of lightning jerking with the best magnetos yet made. Divide

dock: about as big as an average harbour. In any case, what a cheerful proposition for commercial navigation. Yet, conceivably, her flotation would be always assured. But why, when flotation is never assured for one instant, yet landing has just as certainly to be accomplished somehow, attempt to create a like monstrosity for aerial navigation? It has been done, someone else will say, either way, with both Ilia Mouremetz and Fritz. No doubt. Russians are brave and credulous enough, Germans brave and stupid enough, to attempt anything. But why should we try to pay any more debts to Providence with our eternal I.O.U.'s of chancing our handicap?

Apparently, then, we must above all things keep our power in units and within the beam-dimension of a single hull body. We come then to the V-type, and star one immediately, or even two in the case of a two-stroker. But even in the latter case, given a fairly close knowledge, not only of pending developments but reasonable possibilities, one cannot see more than 1,000 to 1,200 h.p. got out of a dozen cylinders,



300 H.P. GREEN ENGINE

it by 4—and do but consider the proposition of four magnetos mechanically—and then you have a 3,375 imitation of efficiency: very difficult.

Let us, for the sake of a clear mental basis, never overlook the fact that enormously greater powers, at least double any 200 h.p., are not only "bound to come," but that they are positively the demand of the moment; no further advanced than recognition and preparation should ever be in front of actual production.

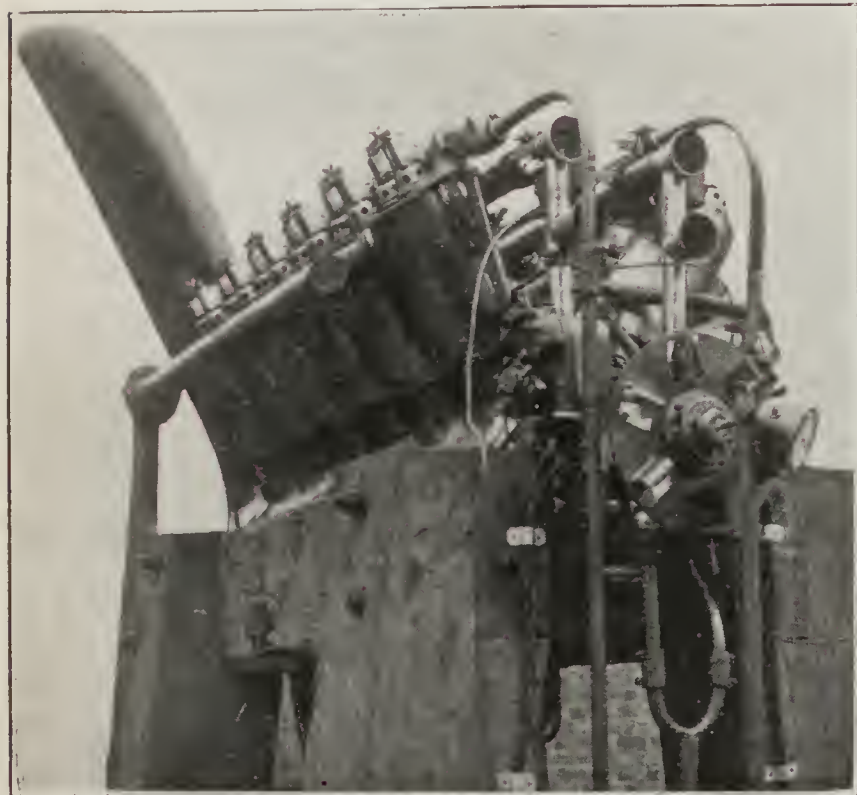
What are we going to do then to overcome the apparent mechanical limitations of the power we may install? Let us then begin by sifting out our analogies, *according, if you please, to the actual working conditions of flying, and landing.* Disperse your power into several units, says someone. Have we not ships with four, five, and even six propellers? Quite so; and, if you notice, the several power units which drive those propellers are fairly narrowly crowded, sidewise and endwise, within a space not greater than one-eighth or less of the hull length. Much about the same space as a single power unit occupies in an aeroplane fuselage or nacelle. They are not placed out at the ends of flying girders, port and starboard. Yet you propose to establish precisely that mechanical equivalent when you talk of placing motors out to port and starboard, between planes or in extra fuselages. Again, your gigantic marine catamaran—if she got through a breezy Western Ocean passage still on top—might conceivably be worked into a dock. Some

even from high speed at 2,000 r.p.m. geared down to a two or two and a half reduction at the propellers. Which translation, incidentally, is going to take some doing in such powers.

Such a motor, or even two, side by side in a six-foot beam, would sit somewhat down by the head when it comes to trim, as they could not be conveniently decked over. Which, as we have seen, doubles their length for the c.g. path and restricts effective load space to that length. Do not let us imagine that this question of c.g. path and trim is going to be affected by the size of our 1,000 h.p. aeroplane any more than its correct ratio varies afloat. So we are brought back again to our horizontal opposed type, until again we come up to its probable limit of mechanical convenience—or even possibility—somewhere about 1,750 h.p. But even this can scarcely be the limit of even the next ten year's demand. What then? We must, I fear, forsake the internal combustion motor—a freak at best, albeit of marvellous ingenuity—and divide up our power again into direct driving units, long and narrow, with at least half a dozen expansions each, "crowdable" and capable of being decked over *beneath* the effective load space instead of endwise to it. And to increase the possibilities of that effective load if possible. In fine, by using turbines working on an absolutely closed cycle, though with another fluid medium than water, reacted upon by any hydrocarbon producer of B.T.U.'s.

THE 300 H.P. GREEN ENGINE

THERE is no aero engine produced in any country in the world that possesses a finer record than the Green, which has the further additional and far from negligible merit of being the first British aero engine ever produced. The successes of the Green engine in the past have been too numerous and are too widely known to require recapitulation in detail; our readers need only be reminded that it was with a Green that the first recorded flight of a mile was made in this country, that it came out a brilliant first in both the Alexander competitions, and that it won hands down the great Aero Engine Competition organised the year before last by the Admiralty and the War Office.



300 H.P. GREEN AERO-MOTOR

Three principal standard types are now on the market, the six-cylinder 100 h.p., the six-cylinder 150 h.p., and the twelve-cylinder V-type 300 h.p. With the details of these three types our readers are familiar; the latter notably was very fully described in our columns some months ago (August 25, 1915). Nevertheless, it may be useful here to set down the complete specification of this excellent motor.

Specification of 300 H.P. Green Engine

Cylinders—The cylinders are made of cast-steel, having a bore of 142 mm. and a stroke of 172 mm., machined outside as well as inside, and ground to fine limits. This process ensures material being of equal thickness and a corresponding equal expansion and contraction, which it is impossible to obtain with monobloc castings, or where the jackets are cast with the cylinder. The valves being set in the head allow the piston to sweep clear any deposits on each stroke, there being no tortuous passages or pockets where carbon may deposit, the result being that very long runs at full power may be made, and the engine still remain in a perfectly clean condition.

Aluminium—All aluminium employed is of a special alloy of high tensile strength, the crankbox being so designed as to form a girder section of immense strength. The bottom half is merely sheet aluminium, to prevent the escape of oil. This type of construction ensures rigidity, and thereby makes the engine most suitable for very long periods of running under full load.

Connecting Rods—These are made from a stamping of 70 tons tensile steel, oil hardened and machined all over, the bearings in the big end being of a special white metal run direct to the steel; the gudgeon pin is fixed to the connecting rod with two set screws and floats in P.B. bushes

in the piston. This practice has been adopted after a number of years' experience.

Crankshaft—The crankshaft is of a special material to Government specification, hollow for the purposes of lubrication, ground and polished all over.

Water Jackets—The water jackets system being the company's patent, has been employed from the manufacture of the first Green engine in 1906, many years before any British manufacturers had turned their attention to the construction of aeroplane engines. This system has been employed with unqualified success, and in the latest model the same system is used, with no modifications whatever. It consists of a copper jacket stamped from one piece of metal of equal thickness at the top and bottom; this is pressed over the cylinder, and the joint at the bottom being made into a rubber ring which allows of free expansion, which is absolutely essential.

Valve Operating Gear—The method of operating the valves (which is another of the company's patents) is extremely simple and effective, and by taking off three nuts the camshaft operating gear may be thrown back, and both inlet and exhaust valves removed. The removal of the twenty-four valves in the engine can be easily accomplished in half an hour. This method has distinct advantage over the type of engine in which it is necessary to remove one and in some cases all the cylinders before a valve can be removed.

Weight—The weight of the 300 h.p. is 970 lbs. This includes magnetos, carburetters, water pipes (inlet and outlet), induction pipes, carburetter control gear, oil pumps, and water pumps—in fact, quite ready for running. The radiators and water, also water in cylinder jackets, weighs from $\frac{1}{2}$ to $\frac{3}{4}$ lb. per h.p., according to the type of radiator used.

Lubricating System—The lubrication of the engine is of the forced-feed type, and is duplicated; either of the two oil pumps will supply sufficient oil to effectively lubricate the engine. The oil is drawn from a reservoir and pumped into the crankshaft at the main bearings; it is then forced through a conduit in the web of the crankshaft into the crank pin. No oil is allowed to remain in the crankbox, but is returned to the reservoir immediately.

Revolutions—The engine turns at a maximum revolution of 1,200 per minute, therefore no reduction gear is required, which effects considerable saving in weight and no loss of power; and the r.p.m. being so low the life of the engine is considerably increased.

Carburetters—Carburetters fitted are of the Zenith make, long experience proving that this type is the most effective and least likely to get out of order.

Petrol Consumption—The petrol consumption is .63 pints b.h.p. hour.

Direction of Rotation—Another feature of the engine is its capability to run in either direction, the alteration taking about two hours. This is of especial value, as the engine can be used either as a pusher or tractor at very short notice.

Water Pump for Cooling System—The water pumps are of the gear-driven type, and are of abundant capacity to effectively cool the engine.

Other Essential Points—Other features worthy of note in the construction of the engine are: Cylinders are copper deposited over the whole of the outside, which prevents rust accumulating under the water jackets, thereby increasing the length of life of the water-pump gear wheels, which is an important point. The carburetters are so cowled that the correct amount of hot air is drawn from the crankcase; this prevents freezing at high altitude, and no smoke is visible when the engine is running in the plane. This in the case of a tractor machine is very essential for the pilot's comfort. Cylinder bolts, which are of 70-ton tensile steel, are fitted from the cylinder flanges right through to the main bearing cap.

RANDOM REMARKS

XLII.—MY OBSERVER By ARTHUR LAWRENCE

IN my last article I gave a description—necessarily vague, so that the enemy should not be able to counter the Pterodactyl arrangements for his destruction—of the aeroplane which would brush away Fokkers with greater ease than a horse's tail sweeps away flies. I see that I omitted to mention that the Pterodactyl-Maupassant-Lawrence is a two-seater. You can carry with you an Observer or one of your Creditors in accordance with your wish to be a militant or an assassin. In my previous spasm I left my machine amidst the 50,000 square yards of people who had come to admire it at Hendon, whilst I took a Tube south for my knighthood. Perhaps the honour done me was premature. My machine had flapped its way for a few miles, but it had not yet encountered the enemy. There was the machine, but now I had to allow for the human equation. I could trust no hands but my own for its guidance. My nervous system has a tremolo movement which has the right effect on the delicate controls of the Pterodactyl. High thinking, hard living, and asceticism have taught me how to put my foot on the brake. Yet as the levers operating the machinery connected with my new aeroplane has 277 movements, jewelled in every hole, to say nothing of an escapement for all parties concerned—an ingenious combination of trap door and parachute by which one can drop

safely to earth in the case of a collision or other unpleasantness—it was impossible for me to work the thing single-handed. Nor am I selfish. I had no Kronprinz sort of desire to carry off the honours alone.

So I had to advertise for an Observer. A ten shilling small advertisement in the *Evening News* brought me 2,999 replies. This is a feeble pun on the German word "nein," and means that the answers amounted to numero deux. We are all linguists now. One was from a lady, and as I have married her since, perhaps the less said the better. I accorded a private interview to the other applicant at about the same time. When he entered my presence he apologised for having applied under the prosaic name of R. U. Dunn Browne. Imagine the pleasure I felt when I recognised our old friend De Rougemont. His years numbering more than three score and ten he was, if possible, brighter and more agile than ever. "Never," I exclaimed, after he had perched himself on the sideboard with one of

my best cigars in his hand, "never shall I forget how you rode the turtle in the waters of our beloved London Hippodrome." "Nor shall I," he replied, "for I have the marks on me yet." "Yes," I remarked, "I rather thought that those front flippers would prove awkward things." This naturally brought us to discussing the bird-like motions of my new flyer. "Mon Dieu," cried De Rougemont, throwing his hands outwards and shrugging his shoulders, "I have never seen anything like it." "And yet," I said, "you have seen some things in your time." "Not 'arf," he replied, suiting his language to my usual associates.

"Well now, old scout," I said cheerily, "coming to business, are you prepared to take on this job on the usual Lord High Admiralty terms; or even on the Floating Corpse scale, with a bit extra for every enemy 'plane biffed and every Hun knocked out of time?" "I am that," he replied, as he ran up the curtain and threw monkey nuts at me from the beading just to show that he had not lost his old time agility. Softer than wool and as swift as tiger he lept down beside me. "And look you," he said, "you will find me no common observer. I have with me my X-Ray detector." It appeared to be a very small matter. You only had to scroodle it into your eye like a miniature monocle. "With its aid," he continued, "you can see through walls, windows—and politicians. Take the house opposite." I fixed the thing to my eye and glanced at the upper storey of the house most adjacent. Then I put it down hurriedly. "Why," I exclaimed, "I always thought he was the most respectable old chap in the neighbourhood. Cht! cht! Been a sidesman for years. One never knows, does one? Not really, I mean. Well now, De Rougemont, it's agreed that you're the man for my money. I propose to start for Schlitzstiffen at once. On the way we shall kill the Crown Prince and pay the same tribute to his kind father. It will only be knocking the top off the weed, but I rather fancy that the double event will create an impression. It is now a case of the Prussian fighting the German, and if we smash up the dynasty there won't be much left for the Germans to fight for." "Napoleon!" said my partner in this brilliant

enterprise, "I am with you to the last flap!" Lighting my meershaum and donning my new Lacey overcoat, we nominated a place where refreshments are supplied on the terms laid down by McKenna and Lansdowne, and strolled out together.

(We hope to give a further instalment of this thrilling fiction next week)



THE ESCAPEMENT

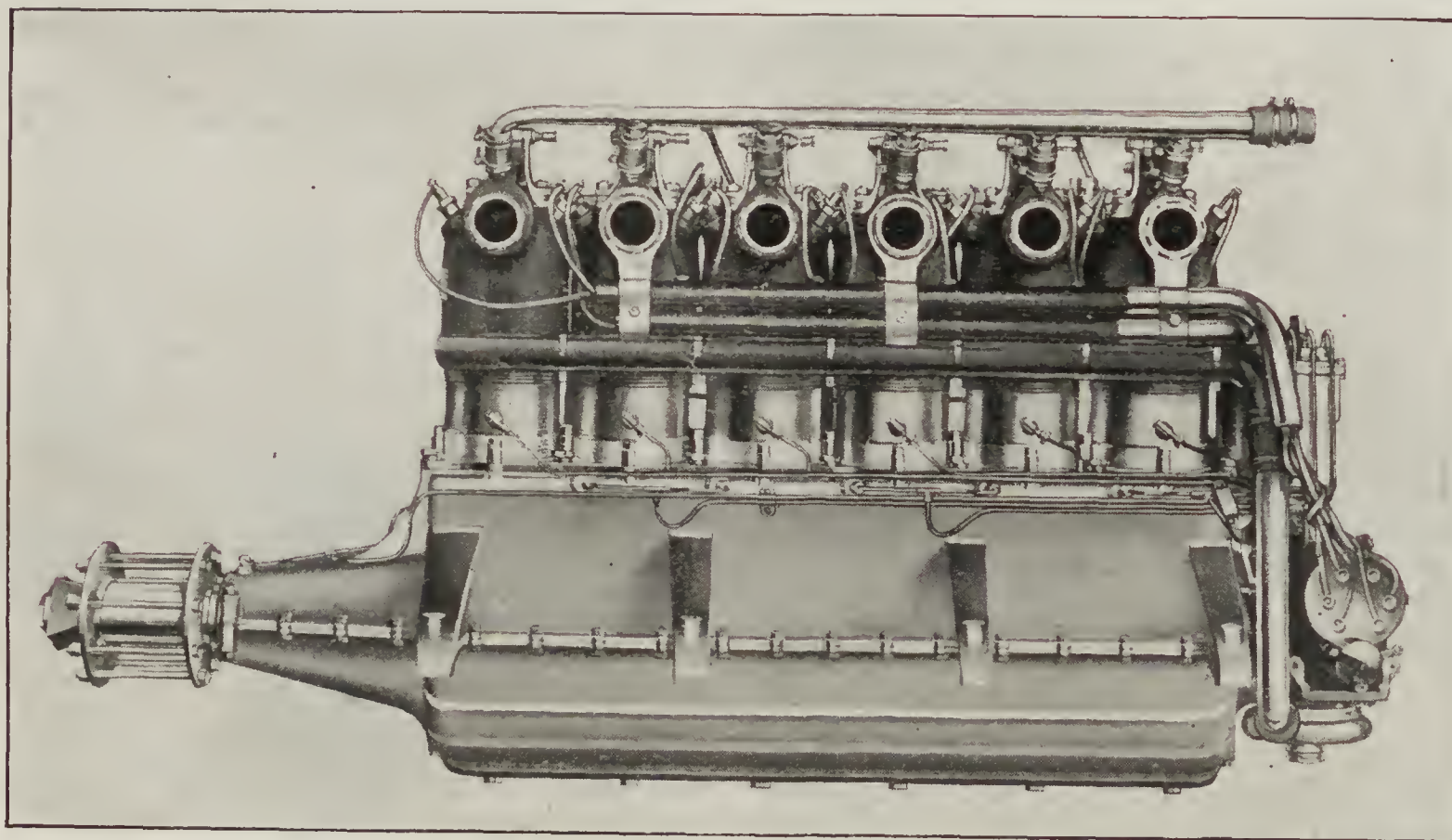
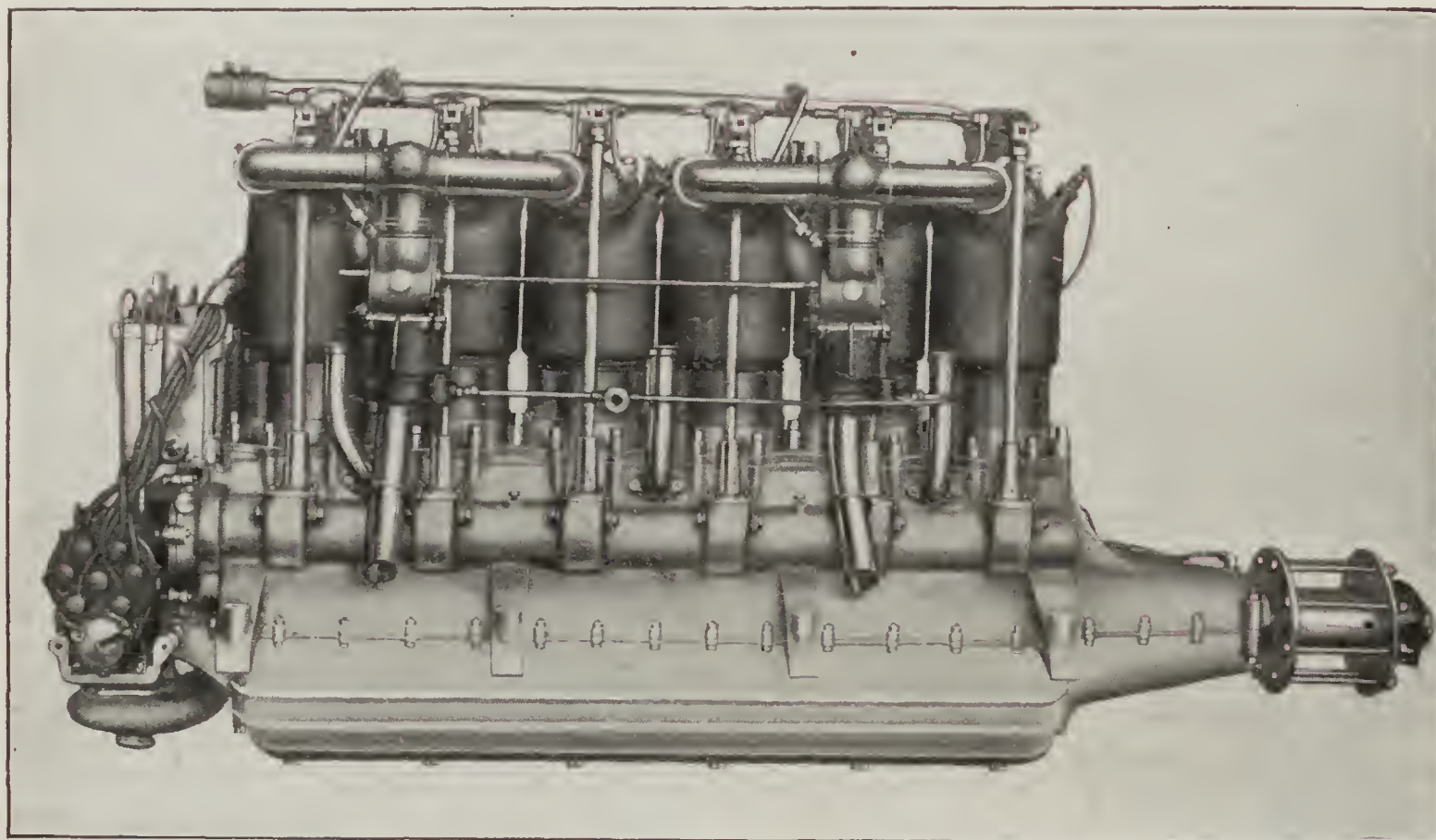


DE ROUGEMONT

THE 120 H.P. BEARDMORE ENGINE

FEW aero engines have a finer record than the 120 h.p. Beardmore. The design, it is true, owed its inception to Austria, but for some years past the Beardmore has been exclusively British. It is now manufactured for Messrs. Beardmore on an extensive scale by Arrol-Johnston, Ltd., of Dumfries. Unfortunately we are prevented from giving any

passed over in silence. It may, however, be recalled that it was an engine of this type that enabled S. F. Cody to win the first prize in the international military aeroplane trials in 1912, and that it was with a British-built Beardmore that the world's height record was established in the summer of 1914. Provided it is not tackled by enthusiastic mechanics with a



THE 120 H.P. BEARDMORE ENGINE, SHOWING CARBURETTOR AND EXHAUST SIDES

detailed account of the enormous expansion of the latter firm's activity since its accession to the ranks of aero engine manufacturers.

The engine, too, is sufficiently well known in detail to render renewed description of the original type superfluous, while any recent modifications and improvements must be

cold chisel and a sledge-hammer, the Beardmore is one of the most reliable aero engines ever produced, and when properly handled should give a full 150 hours running without needing overhaul. The fuel consumption is satisfactorily low, amounting to no more than 0.65 pints per h.p. hour.

THE 160 H.P. CURTISS MOTOR

THERE has been nothing so remarkable, so startling even, and significant of the marvellous recent development of the aviation industry, as the extension of the Curtiss Motor Company. Moreover Curtiss was the first to recognise the necessity for and to produce in America an engine of higher power than the 100 to 120 h.p. type previously in use, with the result that the 160 h.p. Curtiss has not only become a recognised standard type but has widely found imitators. Incidentally, it is no indiscretion to state that Curtiss motors of considerably greater power will soon see the light of day. A full description and specification of the 160 h.p. Curtiss appeared in our issue of May 12, 1915.

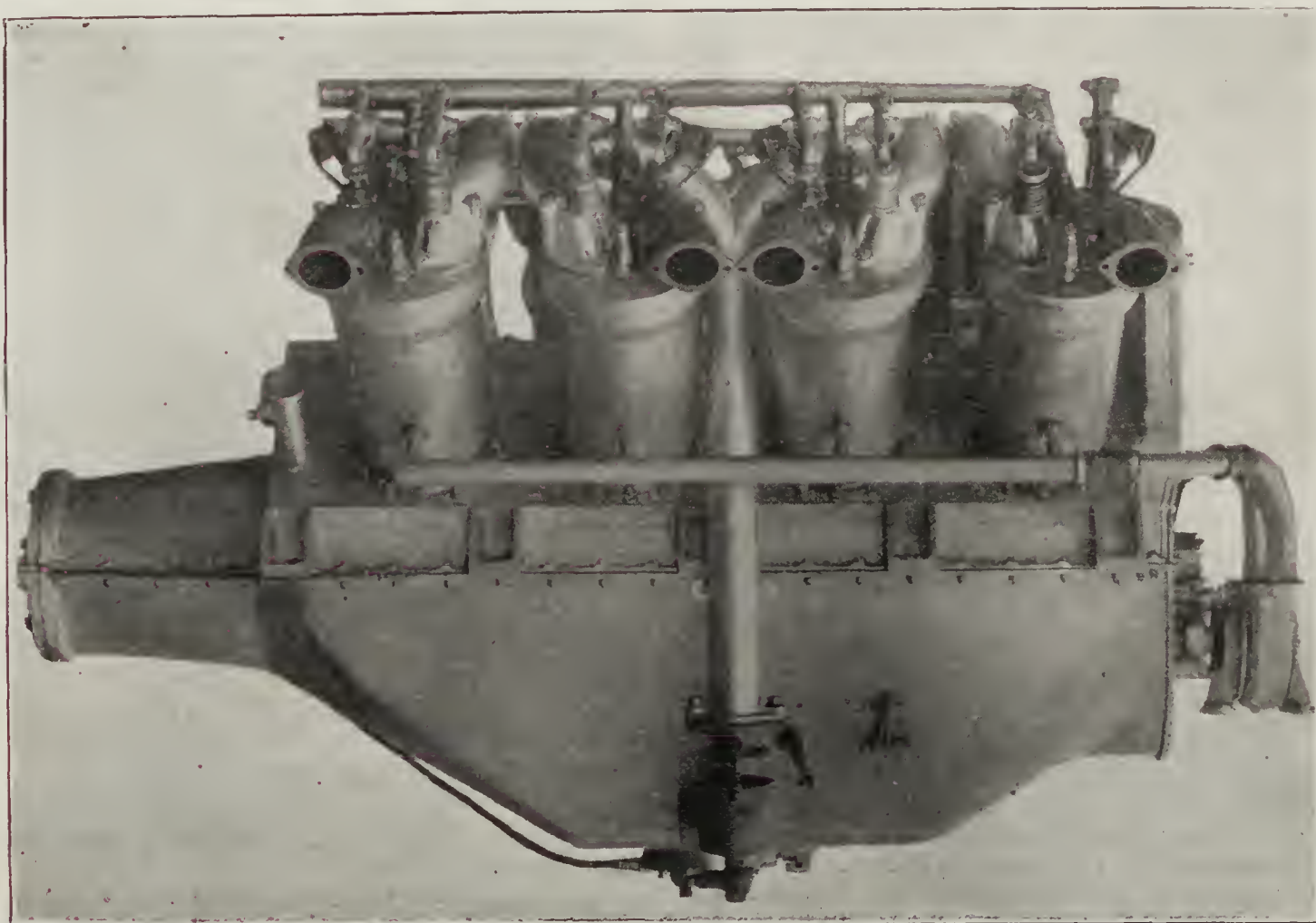
Briefly recalling the main facts, it may be stated that this engine is a V-type water-cooled motor, with a bore and stroke of 5 in. by 7 in. The indicated h.p. of 160 is given off at 1,350 r.p.m. It is equipped with double ignition (Berling magnetos), steel cylinders, aluminium pistons, a

are balanced separately and also after being assembled, thereby ensuring a perfectly smooth-running motor.

The method of factory production is broadly modelled on that adopted by the large motor car manufacturers. This has been found in practice to ensure absolute standardisation together with a maximum output.

About 3,000 men are employed in the production of the various models. The better-known types are the R2, a fast military tractor machine, which combines weight-carrying capacity with high speed, and is fitted with a 160 h.p. motor; the JN4, an improved form of an old and firmly established successful type of school machine. There are many larger machines, of which it is obviously impossible to say anything definite at the present time.

The success of the Curtiss motor may be largely ascribed to the system of inspection employed. The inspection room is exceptionally well equipped with gauges and test appa-



THE CURTISS "V 2" 160 H.P. AERO ENGINE

chrome vanadium crank shaft, pressure feed lubrication forcing oil through the cam shaft and connecting rods at 30 lb. pressure, centrifugal water pump, and detachable propeller nut bolting on to a taper. The petrol consumption is 14.75 gallons per hour, and the oil consumption 1.975 gallons per hour, figures corresponding to 1,400 r.p.m., equivalent to the production of 167-173 h.p.

At present the Curtiss Company has eight large factories constantly employed in turning out machines for the Allies. These have a capacity of five engines a day. Twenty complete aeroplanes can be turned out each week, all of them to conform to stringent Government requirements as to design. In normal times, when the energies of the factories are concentrated on several standardised types of machine, this output could be increased to 25 or more machines a week.

The system of inspection at the Curtiss plants has always been very severe. Machine parts have a tolerance of half a thousandth of an inch. All crank shafts are subjected to a static and a running balance, connecting rods and pistons

ratus, which includes a set of Johannesen's gauges, which are absolutely world's standard for instruments of precision. There are also many special appliances and gauges which are made in the Curtiss tool room. Anything which does not come up to the required standard is ruthlessly "scrapped."

As an example of the thoroughness with which work is done at Buffalo, it may be mentioned that magnetos instead of being fitted direct to the engine on receipt from the manufacturers, are given a ten-hour bench test at 3,800 r.p.m., which is equal to a 35 per cent. overload. As a result of this procedure, magneto troubles have been practically nil.

As the result of investigation, it was found that 25 per cent. of motor trouble experienced was due, directly or indirectly, to the presence of foreign matter in the engine. It was thought that this could be got over by insisting on absolute cleanliness in the assembling departments. All parts before assembly are thoroughly scraped, cleaned and washed. Such parts as are not used immediately are greased and covered up.

THE 135 H.P. THOMAS AERO-MOTOR

CYLINDERS—The cylinders are of the "L" head type, cast in pairs of a special, hard, close-grained iron. The integral water jackets are designed to provide ample space around all parts of the cylinder. The valve caps are water-cooled and are easily reached by the removal of an aluminium cover plate. The cylinder feet are of ample proportions with holding-down bolts close to cylinder barrels.

Valves and Valve Mechanism—Valves are of tungsten steel, made in one piece without welding, and have a clear opening of $2\frac{1}{8}$ in. Valve springs are of special alloy steel, to ensure continuous service under the most severe conditions. The valve push-rod guides are held in the cylinder feet. The push-rods, made of hardened tool steel, are operated directly by the cams without intervening cam rockers, and are provided with means for readily adjusting the tappet clearances, making a light, durable and simple valve-operating mechanism. Special provision prevents oil leakage at the push rods.

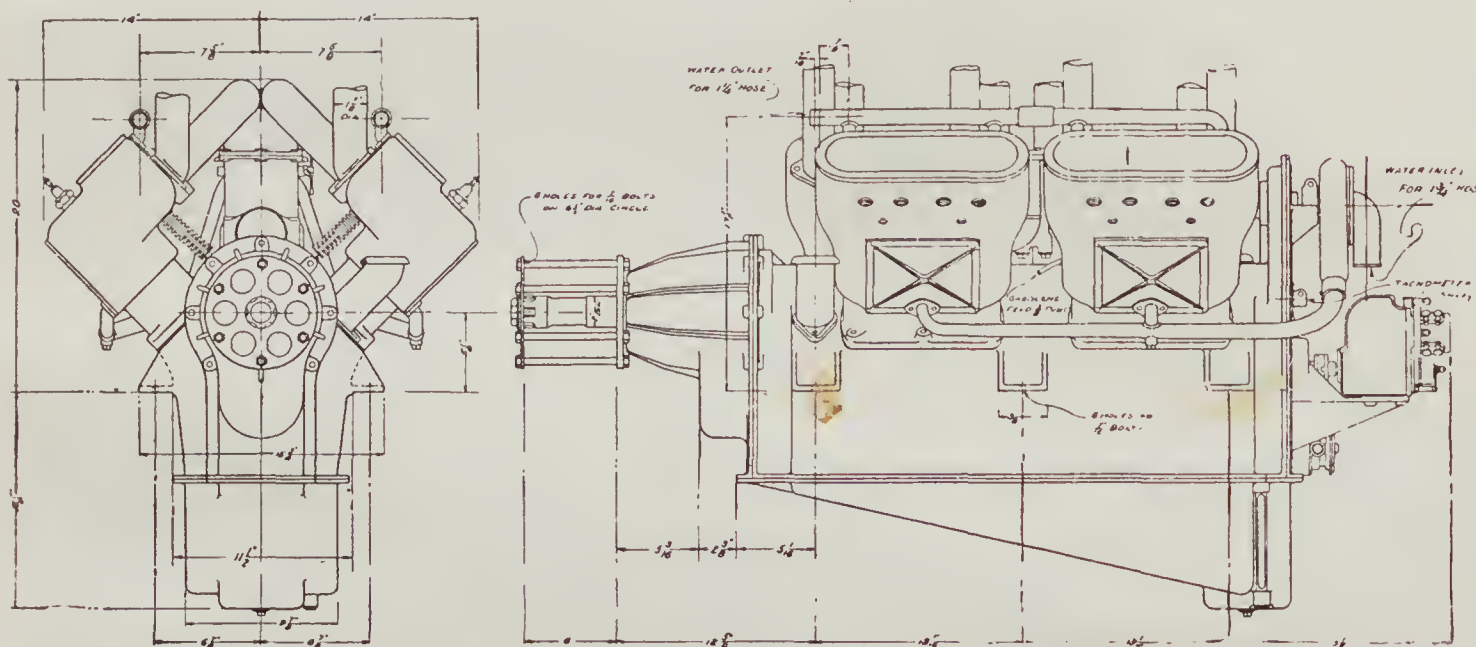
Camshaft—The three-bearing camshaft, with its sixteen

the babbitt being applied directly to the rods and forming an integral part of them. The wrist pins are locked in the connecting rods and swing in liberal bearings in the piston bosses.

Pistons—The pistons, made of special aluminium alloy, are light in weight, and have well-ribbed heads for strength and cooling. Two concentric lap-jointed compression rings located near the head are used. The piston ring is made of chrome-nickel steel, drilled hollow, pack hardened, and ground to size.

Crank Case—The crank case is a special alloy aluminium casting of deep-sided section, well ribbed for strength and rigidity. The lower half serves only as an oil reservoir or sump, and is bolted directly to the upper half. It has a four and one half gallon capacity.

Carburetter—A Zenith double vertical carburetter is used, bolted to a water-jacketed cast aluminium double-branch manifold serving the two banks of cylinders. All manifold



LINE DRAWINGS OF THE MODEL 8 THOMAS AERO-MOTOR

integral cams, hardened and ground to size, is located in the crank case between the two banks of cylinders. To ensure rigidity and long life to the camshaft bearings it is made of generous size and drilled for lightness. The special phosphor bronze bearings are lubricated by high-pressure force feed directly from the main oil duct. The driven end of the camshaft is flanged for bolting to the timing gear.

Timing Gears—The two timing gears, with spur cut teeth, are made of chrome-nickel steel, heat treated. The camshaft gear is bolted to the flanged end of the camshaft. Lubrication is provided by overflow of oil through the pressure regulating relief valve, situated adjacent to the timing gears at the end of the high-pressure main oil duct.

Crank Shaft—The four-throw crank shaft, made of special chrome-nickel steel, is carried on three bearings of liberal length. Journals and crank pins are of generous diameter, drilled for lightness and plugged for the high-pressure force feed lubrication system. The crank webs are also drilled and plugged to lead oil to the connecting-rod big ends.

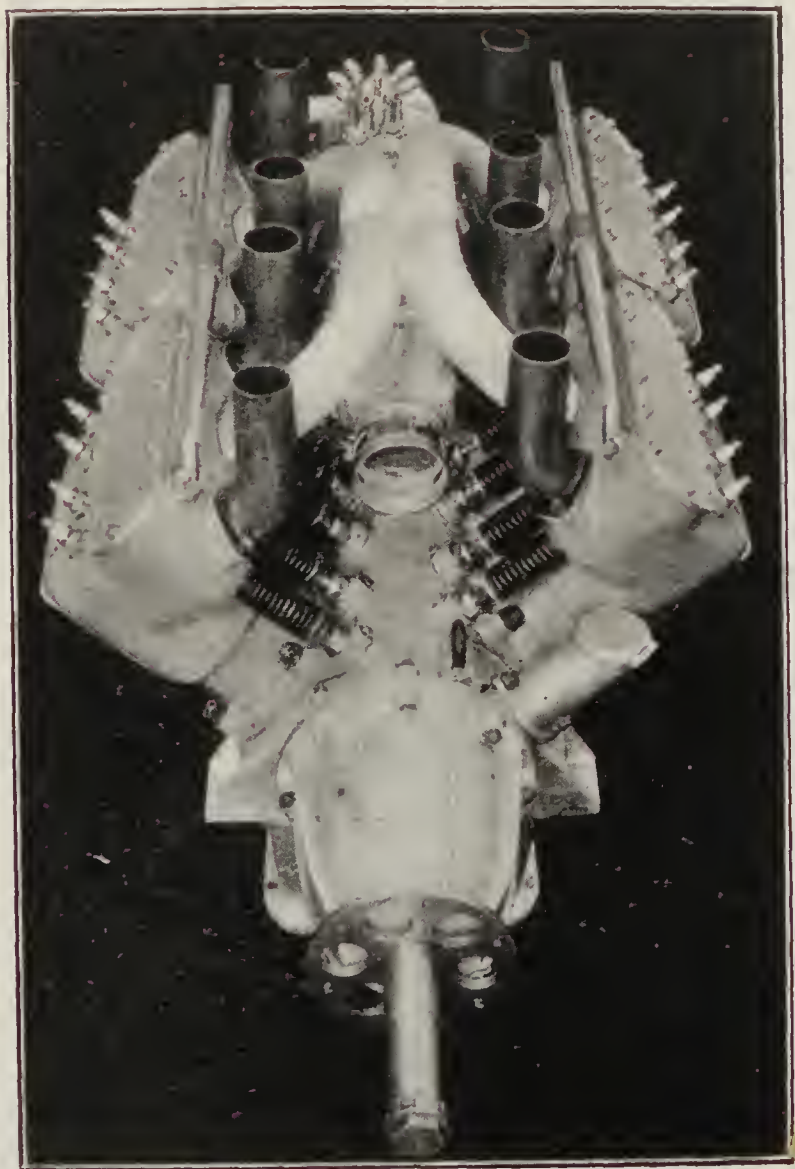
Connecting Rods—The connecting rods are of H-section, arranged side by side on the same crank pin for opposite cylinders. They are made from a special grade of heat-treated chrome-nickel steel, having a very high elastic limit, and are machined all over, securing exceptionally light weight and uniform balance. The big ends are babbitt lined,

bends are of large radii. Hot-air intake is fitted to the carburetter.

Lubricating System—The lubricating system is of the high-pressure, circulating type. The main oil supply is carried in the aluminium sump, covered by a large fine mesh wire screen, which insures clean oil at all times. A gear pump, located within the crank case, and driven from the crank shaft timing gear, takes oil from the sump and delivers it to a main oil duct, also within the crank case. Drilled holes in the main bearing supporting webs, connecting with this duct, lead the oil directly to the three crank shaft and cam shaft journals. The connecting rod big ends receive oil through the drilled crank shaft webs and crank pins. The wrist pins and pistons, including cam and push rods, are lubricated by the oil thrown off the crank pins.

Oil Cooling System—A comprehensive oil-cooling system, entirely independent of the lubricating system, is also provided. Oil is taken from the sump, above the two-gallon capacity level, by a separate gear pump, and passed through cooling coils, and delivered to the sump again. To serve as a tell-tale, this oil may be passed through a sight gauge, under the eye of the pilot, and so warn him when the two-gallon level has been reached. This tell-tale will also prove valuable in the case of flights of long duration, where an oil supply tank is necessary, by warning him when to add oil to the sump.

Water Cooling System—A single centrifugal water pump is operated at crank shaft speed by a shaft located above



THE THOMAS AERO-MOTOR

the cam shaft and driven by a steel gear meshing with the cam shaft timing gear. Equal water distribution to both

banks of cylinders is insured by a siamese outlet from the pump to the brass water pipes at the base of the cylinder jackets. Water outlet connections are arranged over each exhaust valve. All water pipes are fitted close to the cylinders for rigidity and economy of space. Only four hose connections are necessary with each motor.

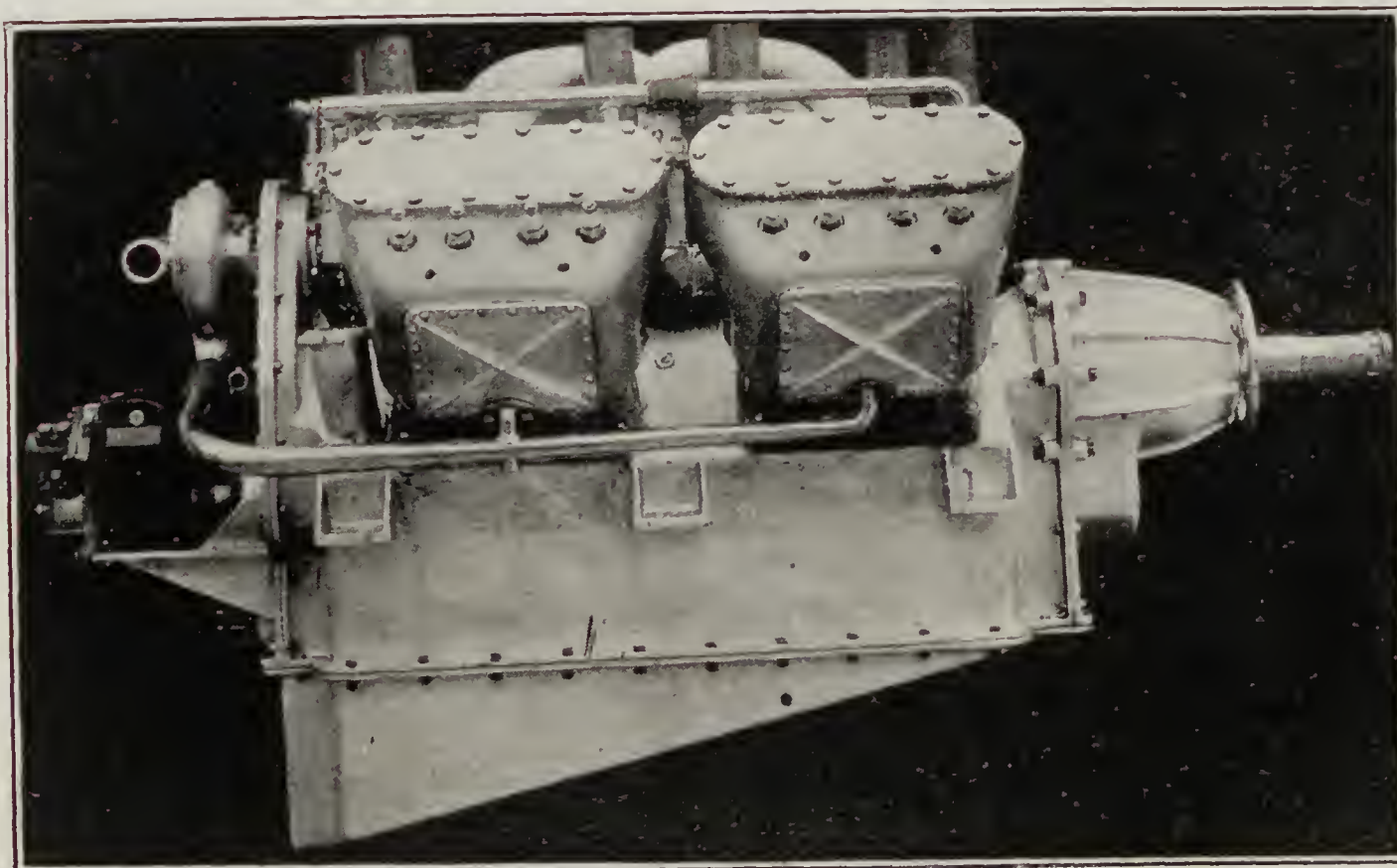
Ignition System—Two Splitdorf "Dixie 80" magnetos are used, each constituting an entirely independent ignition system, with two spark plugs per cylinder. They are arranged side by side, and driven at crankshaft speed by spur gearing at the rear end of the crank shaft. This position insures their operation under the most favourable conditions, besides providing ready accessibility.

Propeller Drive—The propeller shaft is driven from the crank shaft through two spur gears of special chrome nickel gear steel, heat treated. It is rigidly supported by two large ball bearings housed in a well-ribbed aluminium gear case, bolted to the crank case. Both ball bearings are of the annular type, the one near the propeller end of the shaft having a two-row ball race for taking the combined radial load and thrust from the propeller in both directions. The propeller shaft is drilled to secure light weight.

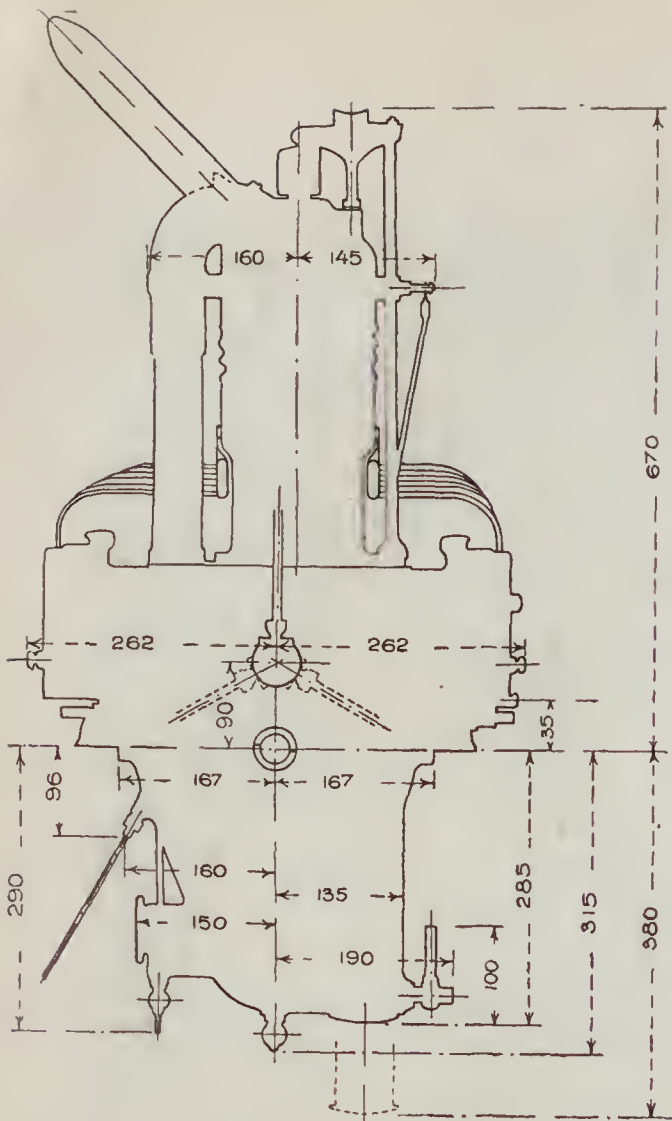
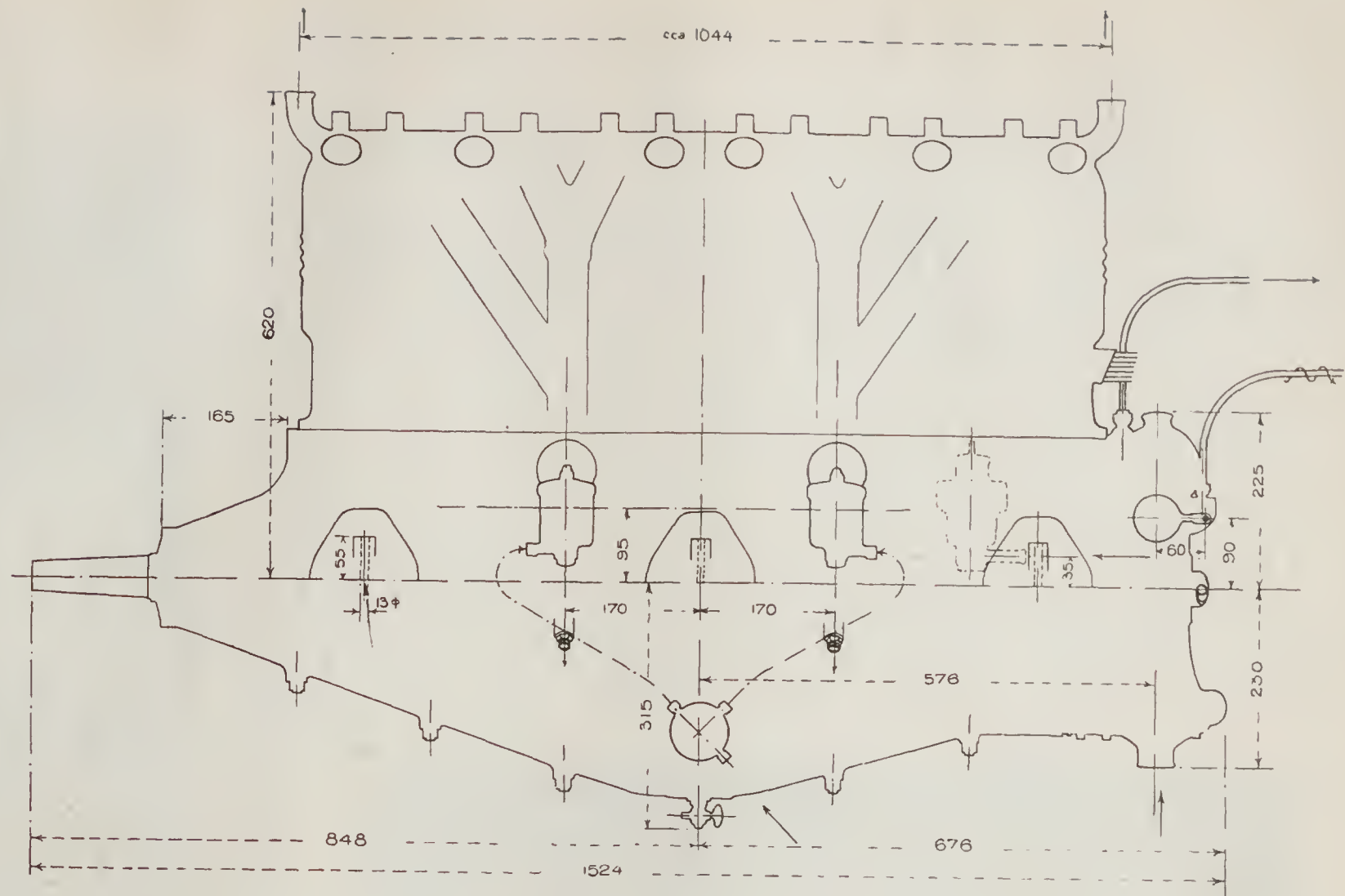
Self-starter—A Christensen combined petrol and air starting system is located between the two banks of cylinders and is driven at crank shaft speed by the same shaft that operates the water pump. In its application to the Thomas motor, no drive shaft is exposed, thus eliminating all chances of oil leakage.

The starter is composed of four different parts: an air pump in operation only when compressing air for storage purposes; an automatic distributor, which is in action during the starting period only; an automatic carburetter, which supplies petrol to the air distributed to the cylinders; and a compressed air tank. The entire apparatus weighs approximately 40 lbs.

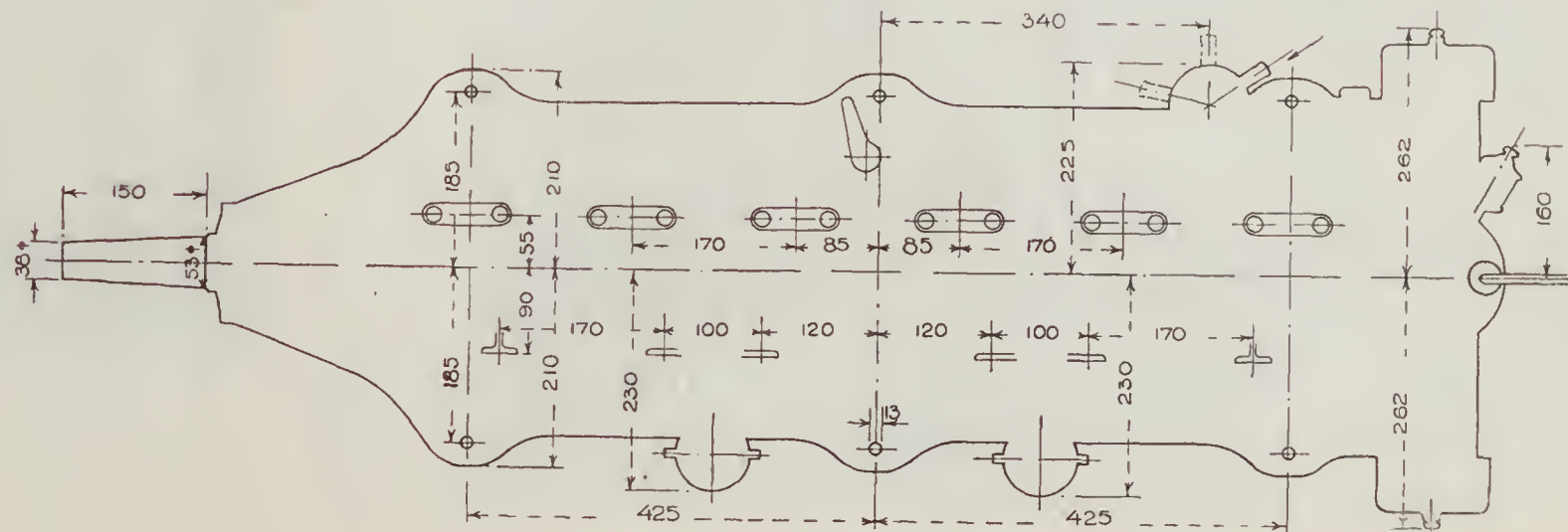
Additional Equipment.—A petrol gear pump is supplied as regular equipment. It is situated near the base of the motor and is therefore gravity-fed. A tachometer drive is also supplied. Provision is made for wireless and stabiliser drive.



VIEW OF THE THOMAS AERO-MOTOR



For the sake of comparison we add scale drawings of the 100 h.p. Benz aero engine, which won the Kaiser prize, and may be taken as the average of the German standard vertical aero engine which has given such excellent results.

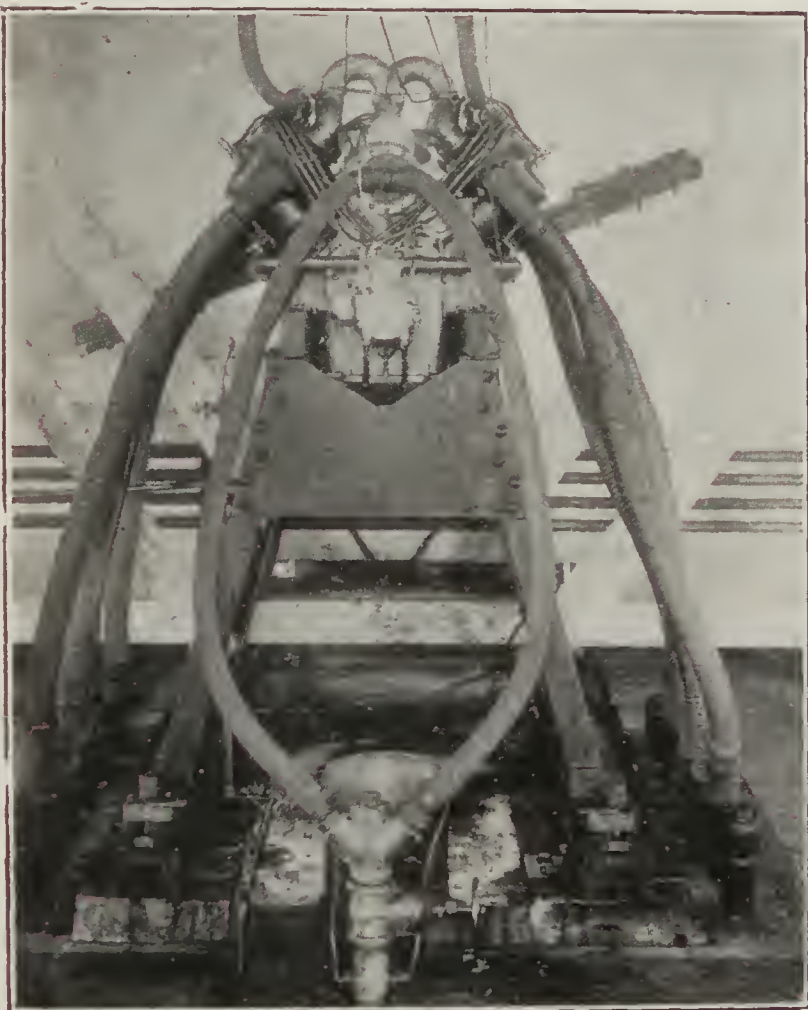


IMPROVED STURTEVANT

140 H.P. EIGHT-CYLINDER MOTOR

THE writer recently had an interesting interview with Mr. H. E. Morton, Chief Engineer of Gas Engine Design of the B.F. Sturtevant Co., Hyde Park, Mass., in reference to their improved 140 h.p. aeronautical motor. Mr. Morton said in part:

"One of the most important features of our improved motor consists of a new type of valve timer. This valve timer, which is in the shape of a cam, not only ensures a smooth, quiet running motor, free from vibration, but at the same time produces a marked increase in the horsepower output of the engine at normal speeds. Furthermore, this valve timer eliminates all of the severe shocks incident to the ordinary type of cam, thereby reducing valve-spring crystallisation and breakage to a minimum.



AN IMPROVED STURTEVANT 140 H.P. 8-CYLINDER AERONAUTICAL MOTOR

Mounted upon a moulinet or fan dynamometer testing stand. During an actual brake horsepower test, short aluminum exhaust pipes, such as are regularly supplied with the motor, are substituted for the long flexible ones illustrated

"We are now prepared to provide these motors with two eight-cylinder magnetos, each constituting an independent ignition system, the cylinders being equipped with two spark plugs apiece. We found until recently that there were no eight-cylinder magnetos available for use on a high speed motor that would operate for any considerable length of time without breaking down in some manner or other. As the result of co-operation, however, between our engineers and those of a prominent manufacturing company, an eight-cylinder magneto has been developed which has proven after a long series of tests to be thoroughly reliable and efficient.

"Provision has been made to permit of the application of the Christensen air starter to the motor. This starter is

extremely light, very reliable and efficient, being particularly adapted for use in connection with aeroplane work.

"The main bearings which support the crank-shaft have been fitted with a special type of babbitt-lined bronze bushings of great rigidity and durability. The construction of these bushings has been worked out in accordance with our years of experience in high speed bearing problems. In addition to our standard designs, we are prepared to supply a gravity feed carburetter located beneath the engine bed and connected to the cylinders by means of a special water-jacketed manifold.

"We can provide at the option of the purchaser a special air pump for use in connection with a pressure feed petrol system. This pump is located on the timing gear case cover, being operated by means of an eccentric on the cam-shaft. These motors are being provided with right or left-hand rotation to meet the demands for two-engine plants. In addition to the regular reduction gear drive, the motors are also offered with a direct crank-shaft drive, which is particularly adaptable for use in dirigibles, etc. The crank-shaft drive can readily be changed over to the reduction gear drive. This allows the motor to speed up over 2,000 r.p.m. with a proportional increase in power.

"The improvements which have been mentioned are only a few of the more important ones that have been incorporated in the design and construction of the motor. These changes have not been made as the result of sudden inspiration, but have been developed gradually after months of exhaustive research work, both in the laboratory and on the test plate, during which time every vital part of the engine was tested to destruction. These tests, which are most severe and exacting in their nature, have proven the wonderful value of proper heat treatments and of the use of high-grade alloy steels. We are constantly experimenting with new heat treatments, but up to the present time we have been unable to better the heat treatment of a single part of the motor."

COMMERCIAL TESTS OF STURTEVANT MOTORS

AS the manufacture of petrol motors for aeronautical purposes has become a more stable industry, purchasers of such motors are demanding careful trials at the manufacturer's plant to determine exactly what power the motor is developing. The B. F. Sturtevant Co. has always maintained a testing equipment at the service of purchasers, and which accurately indicates the power developed and makes possible the determination of all other important data.

The accompanying illustration is a reproduction of a test report on the 140 h.p. eight-cylinder Sturtevant motor exactly as it was made out during the test and witnessed by U.S. Navy officers. Furthermore, all readings were checked by these inspectors.

It will be noted that the sheet is not filled out exactly in accordance with the headings at the top as, for instance, there was no static thrust reading and the torque was carried along into this column. Similarly, in the readings taken with a propeller and shown at the bottom of the report the torque in pounds is shown in the thrust column. The thrust of the propeller was not recorded. It should be understood also that the propeller shaft operates at three-fifths the speed of the crankshaft, which would make the horse-power formula read:

$$\frac{\text{R.P.M.} \times \text{Weight on Scales} \times 3}{1,000 \times 5}$$

The readings show an average of 143 h.p. at an average speed of 1,979 r.p.m. The rated speed of the motor is

2,000 r.p.m., and consequently the power at that speed would be 144.6 h.p. The motor is commercially rated at 140 h.p.

A short description of the dynamometer used will be of interest, although the principle, of course, is well known. The motor is mounted on a cradle arranged on ball bearings so as to allow it to rotate around the propeller shaft centre and also to move parallel to the axis of the propeller shaft. This cradle is supported in a framework at sufficient height

balance through a bell crank and all the readings can be taken simultaneously. Speed is read from a tachometer and by actual count, so that it will be seen that all readings are constantly checked.

Where it is not desirable to test each propeller in connection with the motor which will drive it, a moulinet or fan dynamometer is used and can be arranged to absorb the full power of the motor at any speed desired. As the characteristic power-speed curve of the moulinet is practically the

TIME	RPM	NET WEIGHT ON SCALES	2 T L N P 33000	MECH LOSS IN DYNAMOMETER	BRAKE HORSE POWER		
8.23	MOTOR STARTED						
8.25	1202	204	139.8	1.4	141.2	LENGTH OF TEST	4 HRS.
8.40	1210	204	140.7	1.4	142.1	AVERAGE SPEED	1210
9.00	1212	204	140.9	1.4	142.3	AVERAGE H.P	141.8
9.20	1207	204	140.3	1.4	141.7	GASOLENE AT 60°F	74°BE.
9.40	1207	204	140.3	1.4	141.7	TOTAL GASOLENE USED	290.LBS
9.55	1211	203.5	140.5	1.4	141.9	GASOLENE PER HOUR	72.5 "
10.15	1210	203.5	140.4	1.4	141.8	GASOLENE PER H.P HOUR	.511 "
10.35	1214	203.5	140.8	1.4	142.2	TOTAL OIL USED	26. "
10.55	1217	203.5	141.2	1.4	142.6	OIL PER HOUR	6.5 "
11.20	1209	203	139.9	1.4	141.3	OIL PER H.P. HOUR	.045 "
11.45	1212	203	140.2	1.4	141.6	TEMP OF COOLING WATER	
12.00	1214	203	140.5	1.4	141.9	AT OUTLET	180°F.
12.20	1210	203	140.	1.4	141.4	FEBRUARY 23. 1915	
12.23	MOTOR STOPPED BY SWITCH						

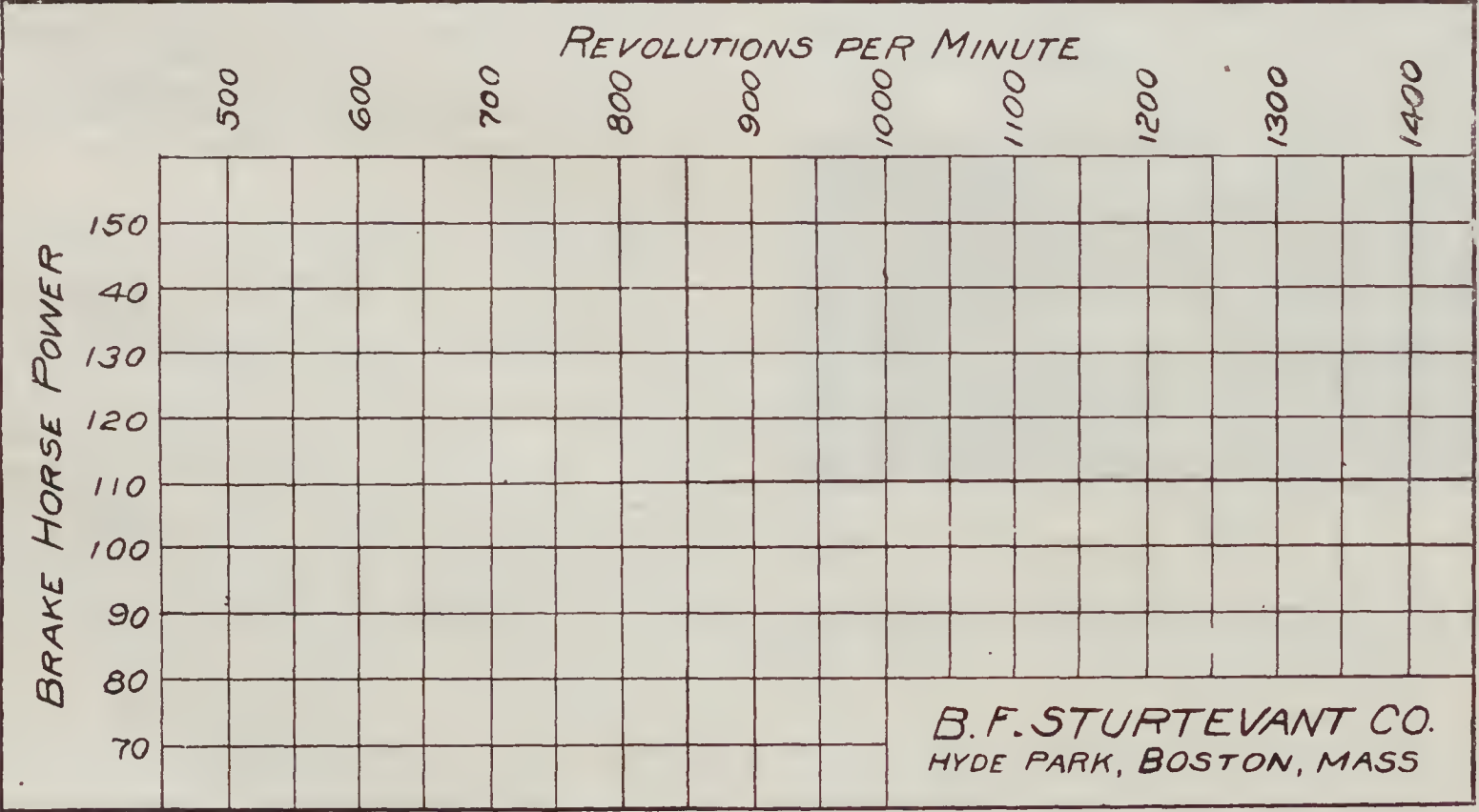


CHART OF STURTEVANT MOTOR TEST

to clear a 12-ft. propeller. A torque arm 63.025" in length is attached to the cradle and, of course, by measuring the pull at the end of this arm the reaction on the frame of the motor is measured. This reaction, being equal to the action, is a true indication of power developed.

There is practically no error which can come into the readings. The torque is weighed through a spring balance on platform scales. The thrust is measured on a spring

same as that of a propeller, tests through the operating range of the motor can be made with it equally as well as with a propeller. In other words, motors tested on this form of dynamometer are always tested under conditions identical to those met with in actual service.

The Sturtevant Company in addition has available a water absorption dynamometer which can be used, and also complete electrical testing equipment. For preliminary tests and

tests of many hours' duration, a number of motor stands are provided and fully equipped so that from the time one motor is stopped another can be mounted and running on the same stand in thirty-five minutes. All this testing apparatus is situated in a large separate building constructed for the purpose and equipped in the most modern way. For propeller tests a part of the roof can be slid back and the two ends of the building thrown open, removing practically all restriction.

Though already well equipped to make practically any kind of test on petrol engines, it is the Company's intention to add further apparatus for special experimental and development work, which is being carried on continuously.

H. E. MORTON

NEW WISCONSIN AERO-MOTOR

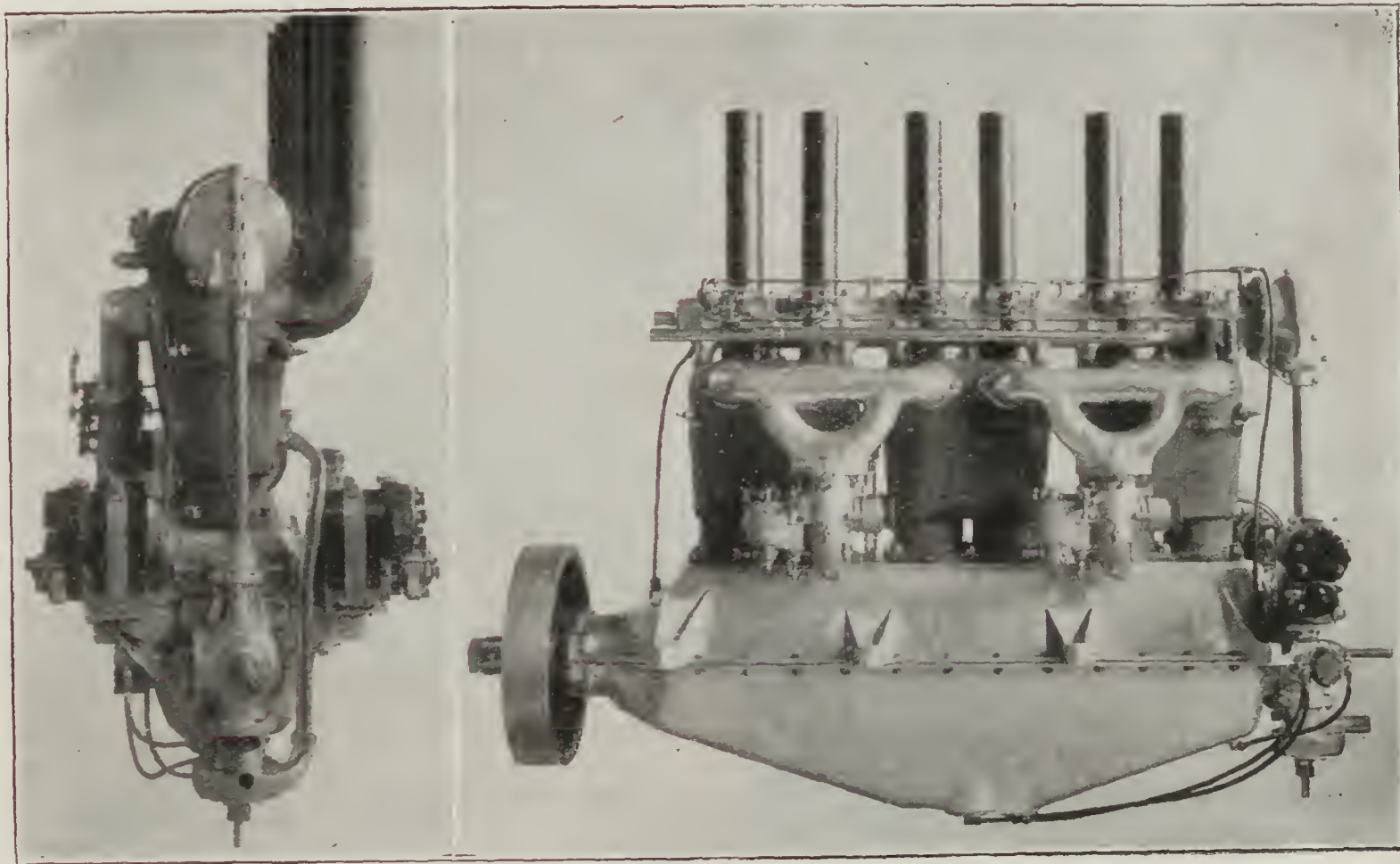
THE Wisconsin aero-motor has finally arrived, after a time of much secrecy as to even the consideration of an aeronautical motor.

The Wisconsin Motor Manufacturing Co. is a well and

The power curve shows a straight line up to 1,400 revolutions, and continues on in a strong curve to 2,300, at which speed the power developed by the six cylinders is 190 h.p. This curve was made with the engine running without the muffler, the exhaust passing out through the stacks seen in the pictures. The normal speed is intended to be 1,200-1,400 r.p.m. In the Government tests the motors ran at 1,200 r.p.m., and at full power for 10 hours without stopping, the only attention given them being an extra gallon of oil, supplied about the middle of the run. The lubricating oil consumption was a little over 1/100th of a pint per h.p. per hour, and the petrol consumption about 6/10th of a pint per h.p. per hour. No adjustments were made on the engine during the tests, and they were found in perfect order after the tests.

THE RAUSENBERGER AERONAUTICAL MOTOR

THE Rausenberger aeronautical motor is of the 12-cylinder 4-cycle "V" type, with the cylinders set at an angle of 60 degrees, and staggered. Every nut, bolt and



END VIEW OF 6-CYLINDER
WISCONSIN

SIDE VIEW OF WISCONSIN 6-CYLINDER,
V-TYPE

favourably known large manufacturer of American automobile engines, and the late new records made by Stutz cars on tracks were made by Wisconsin engines very similar in general appearance to the one illustrated herewith.

Three have just been tested at the United States Bureau of Standards. The photographs show the side and end. The motor has aluminium cylinders 5 in. by 6½ in., with hardened steel liners in which the aluminium pistons operate. The crank shaft is hollow, and this shaft, as well as the connecting rods, valve rockers, all important bolts, etc., are made of chrome-vanadium steel. The motors, without carburetter, magneto and other accessories, weigh 547 lbs., and with complete equipment, including two magnetos, Zenith double carburetter, spark plugs, wiring, muffler, etc., ready to run, weigh 642 lbs. each. (This figures 4'9 lbs. per b.h.p. at 1,200 r.p.m.—130 h.p.).

small steel part is machined all over, heat treated and case hardened to prevent wear and fatigue. All motors are finished in white nickel.

The cylinders are water cooled, bore 4½ in. by 6 in. stroke, cast of grey vanadium iron, bored and ground. Each cylinder has a spun copper jacket. The copper water jacket covers the entire cylinder head, including the intake and exhaust ports. This method of water-jacketing overcomes the scaling of the exhaust valves and stems, a condition that is often presented in hard and continuous running, it is claimed. The intake valves are surrounded by water—the water is somewhat cooled at this point—the heat being transferred to the ingoing gas. The cylinders are submitted to an elaborate system of heat treatment.

The pistons are of fine grained grey cast iron, carrying three double piston rings. They are designed to have ample

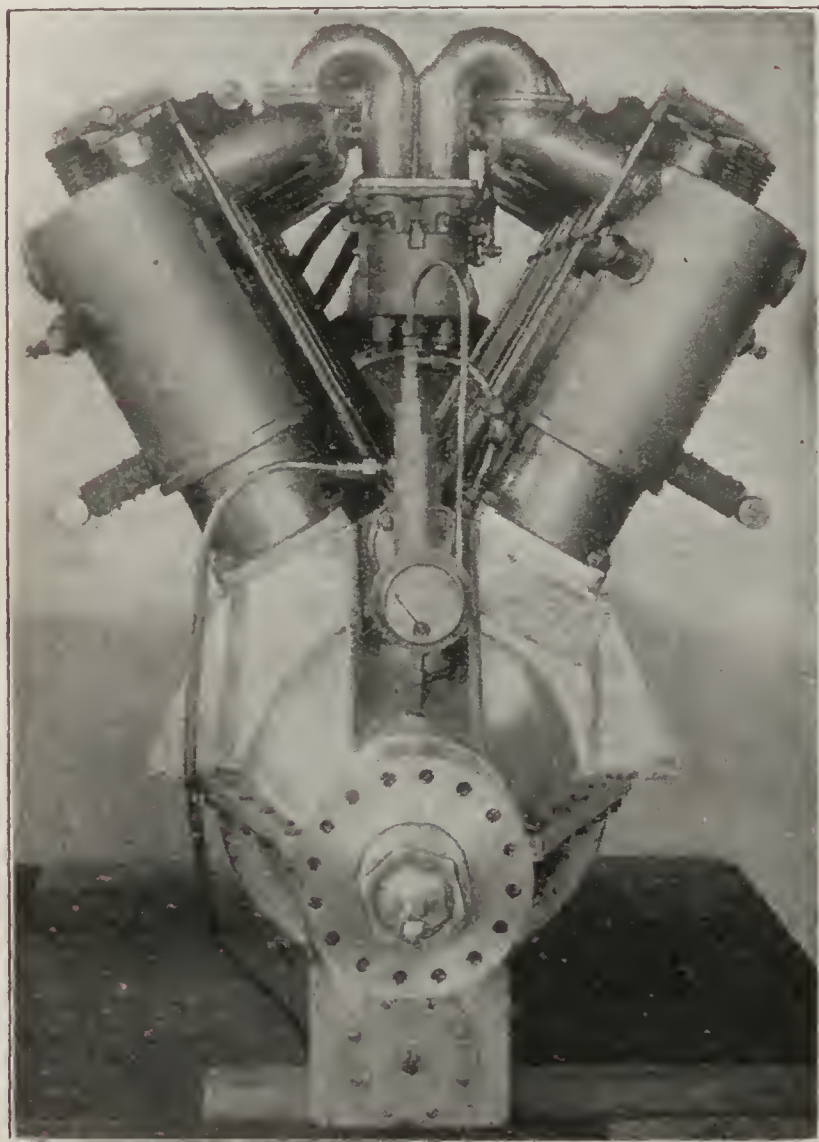
strength with maximum lightness, and the weight of which is only $2\frac{1}{8}$ lbs.

The valves are made of nickel steel 2 in. in diameter, located in the head. Mechanical operation of valves.

The valve tappets have rollers working on cams. The push rods are solid, and made from a special hard steel. The push rods are provided with adjusting nuts that allow the play to be taken up.

The connecting rods are of the "I" beam type, forged from chrome vanadium nickel steel. A bronze bushing is fitted on the wrist pin end, while at the crank end the caps are held in place by two special bolts, clamping brass shims which hold the bearing in place.

The crank shaft is made of heat-treated chrome vanadium steel and is hollow throughout. There are seven main bearings, with an extra bearing of liberal size placed in the case



THE RAUSENBERGER MOTOR

extension. The bearings are all of Parsons' white brass and of ample size and number. They are held in place by two $\frac{5}{8}$ in. studs, with a flat machined washer under each nut.

The crank case is made of aluminium, with heavy reinforcement. A long extension is cast integral on the front of the case, which carries out the stream line effect and takes propeller strains from the crank shaft.

At the end of the extension on the front of the crank case is placed a radial self-aligning thrust bearing of generous size, which can be used for either tractor or pusher mounting without change. The crank shaft is also held at this point allowing it to float free throughout the motor.

The cam shaft is made from a special alloy steel, with the 24 cams cut from solid blanks. This shaft is hardened and ground to size. Like the crank shaft, it is supported by seven bearings, each of which receive oil from an oil line under pressure.

Rocker arms are forged from steel, case hardened and machined all over.

A plunger oil pump supplies all bearings with oil from a reservoir. From these bearings it goes to the splash basin where the extra oil overflows through a filter to a small sump below the crank case. This oil is cooled while being pumped back to the reservoir. The reservoir regularly supplied on the crank case has a capacity for five hours' running. An oil pressure gauge is provided, that may be located in any convenient part of the 'plane. All the oil lines are carefully arranged so as to prevent breaking, and silver solder is used wherever the use of solder is indicated.

Cooling is obtained by a centrifugal pump driven direct from the end of the crank shaft. The water pipe connections are hose with special clamps.

Two double Zenith carburettors are connected by short pipings, one to each set of three cylinders. Each set of cylinders having even intervals, sharp turns are eliminated. The manifold is water-jacketed to promote better carburation and greater efficiency. The consumption of petrol is at the rate of .58 lbs. per horse-power per hour.

Two six-cylinder Bosch magnetos, mounted on the gear case and driven directly off the timing gears, are supplied as regular equipment. Bosch spark plugs complete the standard equipment. The cylinders are cast to take two spark plugs, these spark plugs being placed on opposite sides of the cylinder at a 45 degree angle from the square of the cylinder. This places the spark plugs where they are easily accessible.

The propeller flange has eight propeller bolts and an extra plate to prevent losing the propeller.

General Motor Data: 12-cylinder, "V" type, 150 h.p., $4\frac{1}{8} \times 6$ in.; 960 cu. in. piston displacement; water-cooled; valves in head; two double Zenith carburettors; two Bosch magnetos, normal speed 1,300 r.p.m.

Dimensions: Width over all 24 in., extreme length 5 ft. 10 in., length of engine proper 42 in.

Weight: 590 lbs. without oil or radiator. Complete with radiator, oil, water, etc., 720 lbs.

Equipment: Either two six-cylinder Bosch magnetos for single ignition, or two twelve-cylinder Splitdorf "Dixie" magnetos giving double independent ignition at two plugs in each cylinder. For further equipment a two- or three-bladed propeller of the best quality, and radiator are supplied. A tachometer is also provided.

The power curve shows 150 h.p. at 1,300 r.p.m., 155 h.p. at 1,400, and 160 h.p. at 1,500 r.p.m. The petrol consumption was 0.58 lbs. b.h.p. per hour, and oil 0.038 gals. b.h.p. per hour.

THE ROBERTS MOTORS

WE are in receipt of the principal specifications of the new model Roberts motors which have this season attracted so much attention in the United States through their remarkable performances in exhibition and passenger-carrying planes.

Model—4 X and 6 X.

No. of Cylinders—Four and six,

Bore and Stroke—5 x 5.

Speed—400-1,250.

Guaranteed H.P.—65 and 100.

Weight, Motor only—230 lbs. and 350 lbs.

Radiator—Ideal Cellular, 24 x 24, weight 32 lbs., and 24 in. high, 36 in. wide, weight 45 lbs.

Propeller—Excelsior or Paragon, 8 ft. 4.75 in. or 7 ft. 5 in. x 5 in., and 8 ft. 6 in. x 5 ft. 6 in., or 8 ft. x 6 in.

Carburetter—One for each set of three cylinders, Planhard aluminium floating ball type.

Magneto—Bosch or equal, high tension, one furnished regularly, two optional at extra charges.

Cylinders—Special grey iron. Water jackets integral. Finished all over, tapped for two spark plugs.

Pistons—Aluminium alloy.

Piston Rings—Three to each piston, cast iron one piece $\frac{3}{8}$ in. wide.

Piston Pins—Hollow, hardened and ground with expansion end for taking up wear, 1 in. diameter.

Connecting Rods—Drop forged, I section, vanadium steel.

Crank Shaft—Scott's special automobile steel (vanadium) ground entire length. Hollow $2\frac{1}{2}$ in. diameter in main bearings. $1\frac{3}{4}$ in. diameter crank pins.

Crank Case—Cast No. 12 aluminium.

Bearings—Die cast nickel babbitt. Connecting rod bearings, $1\frac{3}{4}$ in. by $2\frac{1}{2}$ in. Main crank shaft bearings, seven in number. Centre bearings, $2\frac{1}{2}$ in. by $2\frac{1}{2}$ in. Magneto end bearings, 4 in. by $2\frac{1}{2}$ in. Propeller end bearings, 6 in. by $2\frac{1}{2}$ in.

Thrust Bearings—Two in number, combination radial and lateral type, placed one at either end of propeller end bearing.

Intake Manifolds—Cast aluminium, finished all over.

Pump—Centrifugal type, aluminium housing, bronze impeller.

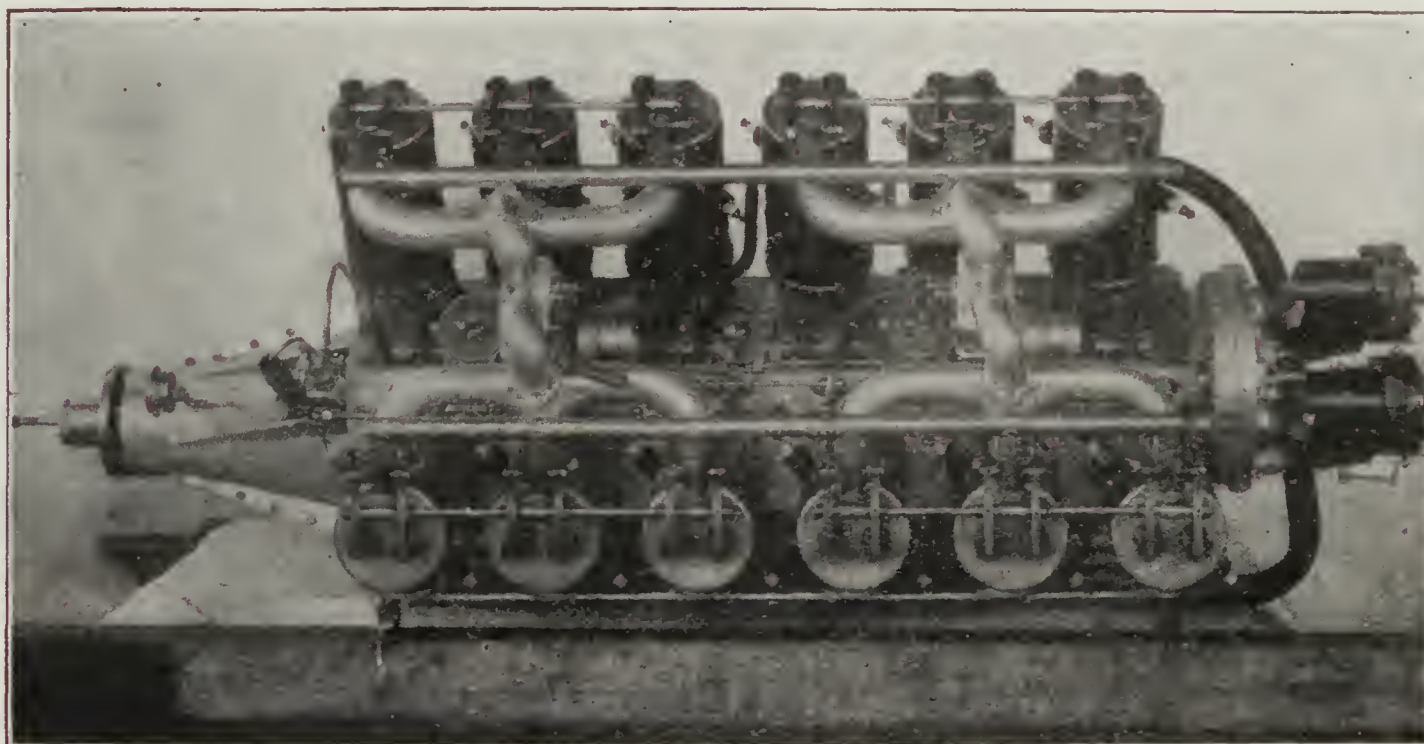
Magneto Drive Gears—Plain spur type, hardened steel.

Lubrication—Working parts lubricated by mixing lubricant with fuel when filling tank, proportion two (2) quarts oil to five (5) gallons fuel. Hard grease cups on main bearings.

placed on the market, weighing only 1,000 lbs. complete with self-starting equipment.

The motor is not only remarkable in respect to weight, but for the power developed is the most compact outfit that has been brought out to date. It is only 7 ft. in length over all, and measures 35 in. over-all width across the tops of the cylinders, while the base is only $16\frac{1}{2}$ in. in width.

There are only three essential moving parts—pistons, connecting rods, and crank shafts. There is not a valve in the machine, nor a spring, cam shaft, push rod, nor any gears with the exception only of the gears for the magneto drive. The motor is started readily and instantaneously by the Christensen air self-starter. This starter embodies an air motor and compressor and small storage tank which is of sufficient capacity to start the engine fifty times without recharging. The compressor runs automatically when the engine is started, charging the storage tank until a certain pressure is reached, when it is automatically cut out. The entire starting outfit is remarkably simple, strong and light weight as compared to the electrical types of self-starter. It is claimed that it will never get out of order. The Roberts Company say that by using this starter they save a full one hundred pounds weight and get away from all electrical complications.



THE 12-CYLINDER RAUSENBERGER

Two of the 100 h.p. motors make up the power plant of the new Benoist six-passenger flying boat, and have astonished everybody by their remarkable power, turning 9 in. diameter by 6 in. pitch two blade propellers at 1,100 r.p.m., and flying the boat with six passengers at 60 miles per hour, which we believe constitutes a record for a motor of this rating in an outfit the size of the new Benoist.

Several other 100 h.p. motors have been installed in the smaller passenger-carrying flying boats put out by the Benoist Company and others this season, and have all done exceedingly well, standing the grind of continuous performance, day after day, without let up or break down.

The 65 h.p. motors have established great records in various exhibition planes about the country.

Another very interesting new motor is manufactured by the Roberts Company.

This is a 12-cylinder V-type motor having cylinders 6 in. bore, $6\frac{1}{2}$ in. stroke, and developing 325 h.p. at 1,150-1,200 r.p.m. The motor has been designed to develop its maximum efficiency and power at the above speed, which is conceded by experts to be the most efficient and best propeller speed. It is one of the lightest motors of big power that has yet been

The motor is designed with an unusually large factor of safety, and the materials entering into its construction have been subject to special analysis and test. The crank shaft and connecting rods are of a special vanadium steel, triple heat treated. It is said by experts that these parts are unsurpassed for strength and durability. The crank shaft is $3\frac{1}{2}$ in. outside diameter, bored hollow for lightness in weight, with walls $\frac{1}{8}$ in. thick.

All bearings are of die cast nickel babbitt, high in tin without a trace of lead. They are cast under very high pressure and are extra dense and free from sponginess. Every bearing is weighed on a delicate balance to determine its solidity and freedom from internal air holes. The sizes of the bearings are unusually liberal, each of the 13 main bearings being $3\frac{1}{2}$ in. diameter, $2\frac{1}{2}$ in. long. The connecting rod bearings the same diameter, 2 in. in length. The weight and thrust of the propeller is absorbed by two combination radial and lateral thrust bearings, one at each end of the crank shaft bearing next to the propeller. These bearings transmit the propeller load directly to the engine crank case, so that none of the crank shaft bearings are called upon to carry any of the strain set up by the propeller.

The crank case is of No. 12 cast aluminium, made extra strong and rigid by flanges and webs properly placed. The cylinders are cast singly of special French grey iron with water jackets integral, and are machined all over. Each cylinder is secured to the crank case by six vanadium steel bolts, four of which pass entirely through the crank case. The effect of this construction is to make the cylinders and crank case as solidly and rigidly aligned as if they were a single unit. The pistons are a special aluminium alloy, which is the Roberts Company's own patent and has been used in their motors for the past five years. These pistons are about one-third the weight of iron or steel and of higher tensile strength. The thermal or heat conductivity of these pistons is about five times that of iron or steel. The superiority of this type of piston is illustrated by the fact that since the Roberts Company introduced it, pistons of a similar character have come into use on all racing automobiles and all of the best aeroplane motors.

The motor is fitted with four special $2\frac{1}{2}$ in. aluminium Panhard carburettors. Each carburettor is connected by an aluminium manifold to a set of three cylinders. This gives an individual adjustment of each carburettor to its set of cylinders, the throttles of all carburettors being actuated by a common lever.

Ignition is supplied by four Bosch magnetos, two magnetos being used on each set of six cylinders. Each cylinder is provided with two sparking plugs, so that ordinarily there is a double spark in each cylinder, and even in the event of one plug fouling or going wrong the other supplies sufficient ignition. The manner in which the magnetos are attached is specially ingenious and noteworthy. All four magnetos are set side by side on a bracket, which is rotated about the crank shaft to regulate the spark. A large spur gear is keyed to the motor crankshaft and all four magnetos are driven from this one gear. It will be seen that this simple drive perfectly synchronises all of the magnetos. A further important advantage lies in the fact that the magnetos are rotated bodily about the crank shaft to secure the advance and retard of the spark. The position of the magneto armatures is thus changed and not the position of the distributors. Thus the magnetos are always set so that the "break" always comes at the point of highest pressure in the current wave. In other words, at the point where the current is strongest. Thus the hottest possible spark is obtained at full retard just the same as at full advance. The great advantage of this in starting the motor can be readily appreciated. Every engineer knows that when the spark is effected by rotating the distributor or circuit breaker, the spark is not so strong in retard or starting position as in full advance or running position.

The motor is cooled by a centrifugal pump of extra large capacity, the impeller of which is keyed directly to the motor crank shaft, doing away with gears or other complicated form of drive. Those who are familiar with the various complicated mechanical lubrication systems on other motors and the great troubles usually caused by such systems will regard the Roberts lubricating system as a marvel of simplicity and efficiency. Lubrication is perfectly accomplished by mixing the lubricant with the fuel when filling the tank in the proportion of two quarts of oil to five gallons of fuel. If the mixing is done according to directions the gasoline and oil make a homogeneous mixture which cannot be separated. As long as the motor receives fuel on which to run the working parts cannot fail to be perfectly lubricated. The main crank shaft bearings are lubricated by hard grease in grease cups.

Thousands of Roberts customers have lubricated their engines according to this method since 1910, and are enthusiastic over the perfection, convenience and safety of this system. It should be noted that an ordinary good grade of medium oil is satisfactory as a lubricant, and no special or expensive kind of oil is required as is the case with many motors.

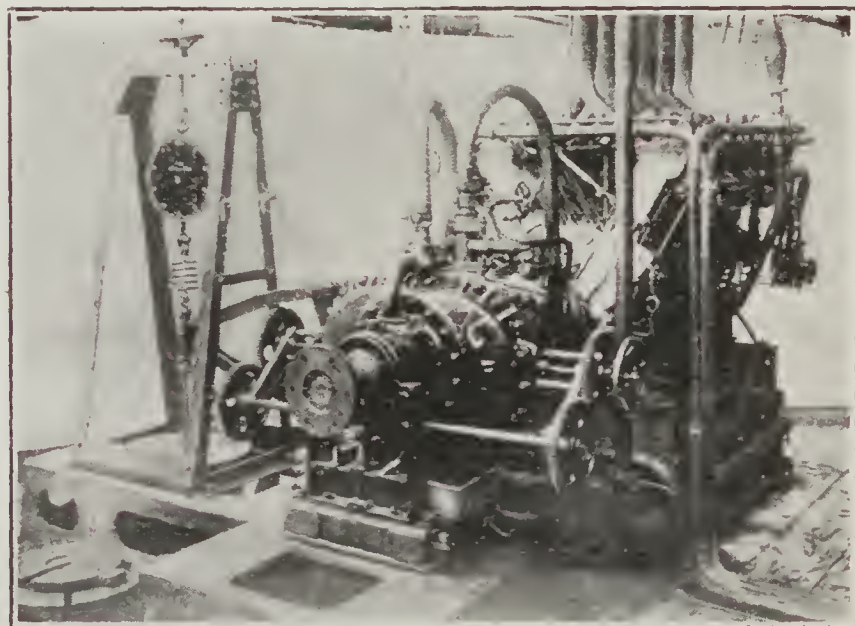
The Roberts factory is busy on orders for these motors which fill them up to capacity for at least four or five months.

After this time the Company expect to be able to manufacture these machines at the rate of 50 or more per month, which will give them a margin to fill individual orders outside of quantity contracts.

It is interesting to note that two of the machines are being supplied for installation in what is claimed to be the largest flying boat ever produced, having a capacity of about three tons useful load. Full particulars of this monster air boat will be contained in an early issue of AERONAUTICS.

THE FROUDE WATER-BRAKE

THERE is no need to dilate upon the importance, from the point of view alike of the manufacturer and of the user, of obtaining an accurate and reliable test of the b.h.p. of an engine, especially when it is of a new type or model, before final delivery. One of the best-known instruments for this purpose is the Froude water-brake manufactured by Messrs. Heenan and Froude, Ltd., of Worcester. This brake is used by the majority of petrol engine manufacturers in this country, among others by the Royal Aircraft Factory, Rolls-Royce, Wolseley, Daimler, Sunbeam, Armstrong-Whitworth, Austin, etc.



"FROUDE" BRAKE COUPLED UP TO A 600 B.H.P. PETROL ENGINE AT PANHARD & LEVASSOR'S WORKS

The Froude dynamometer consists of a rotor revolving in a casing, free to oscillate, through which water is circulated.

Each face of the rotor is formed with a semi-elliptical annular channel divided into a number of compartments by means of oblique vanes, and the corresponding faces of the casing are also similarly divided. Thus the channels on the rotor and casing form two complete annular channels of elliptical cross section, each channel being divided into a number of compartments by the oblique vanes mentioned above. When in action the water in each annular channel is rotated continuously by the centrifugal force imparted to it by the rotor, and passes successively from one compartment to the next. An extremely high speed of rotation of the water is obtained, and the power absorbed by the dynamometer is by this means converted into heat which passes away in the water leaving the machine. The motion of the water causes it to re-act on the casing which tends to turn on the bearings. This is prevented by means of an extension arm, working between stops, at the end of which are the balance weights and spring balance by which the actual power absorbed by the dynamometer is measured.

It should be noted that with the sluices set in any one position, the resistance of the brake varies as the square of the speed, so that the engine can be held at any suitable speed without further attention, since any tendency for the engine to over-run is counteracted by a great increase in the resistance of the brake. On the other hand, any falling-off in

engine speed will cause a great and immediate decrease in resistance, thereby enabling the engine to pick up without the need of readjusting the dynamometer. Hence it is possible to cut out individual cylinders without altering the brake, the engine regaining its original speed as soon as the cylinders are allowed to fire again.

One great advantage of this type of brake is the simplicity of its control and the fact that, once the hand wheel is set to the required speed, it requires no further attention. Moreover, the Froude brake possesses little or no inertia, so that it can be instantly stopped, which materially lessens the chance of serious damage to parts of the engine in the event of a fault developing.

This summary description will suffice to indicate the method whereby power is destroyed and at the same time accurately registered. It should be noted that there is no possible source of error, and that every force which resists rotation of the engine crank shaft is caused to react upon the weighing apparatus. Consequently the readings which the dynamometer gives are 100 per cent. accurate. This is attained without any loss of efficiency or practicability, as owing to the action of the power-absorbing medium the speed of the engine is maintained automatically constant or nearly so.

THE LODGE SPARKING PLUG

It may be said without fear of contradiction that probably as much care and thoroughness have gone to the design and construction of the Lodge "Aero" plug as have ever



LODGE "AERO" PLUG

been lavished upon this refractory portion of an aero engine. This plug, as will be seen at once from the accompanying illustration, is chiefly conspicuous for its cooling properties. It has a single sparking point which is flat and projects inwards towards the central electrode, which is of considerable thickness, and finishes flush with the end of the plug, so that it is not visible in this illustration. The side sparking point and the central electrode are both of pure nickel.

Within the mica insulation the central stem is shaped so that it becomes thicker from the sparking end towards the terminal end, where copper fins are provided. The result is, the heat, which would otherwise accumulate in the sparking point, is conducted away to the outside end and is dispersed by connection to the outside air. Fins are also provided on the steel body of the plug, tending to keep this cool.

It is only on these lines that a plug can be kept at a working temperature and able to stand up for long periods of

continuous firing, which it has to do unfailingly under the severe conditions imposed by the latest R. A. F. engines.

The high-speed, high-compression engines used for aeroplanes undoubtedly constitute the severest of all practical tests for sparking plugs, and it says much for the new Lodge "Aero" plug that it has proved so highly successful under the Government tests, and in use on the Government engines on active service.

SKEFKO BALL BEARINGS

EVERY engine manufacturer knows only too well the supreme importance of incorporating absolutely reliable ball bearings in his motors; it is not too much to say that the entire trustworthiness of an engine depends on its ball bearings, and more than one pilot knows to his cost the consequences attendant upon the breaking of a ball case. The Skefko ball bearings are among the very best on the market; they are now used by the vast majority of the aero engine manufacturers in this country, and as a proof of their excellence it may be added that upwards of 150,000 S.K.F. ball bearings have already been supplied for use in Army and Navy aeroplanes.

TIE RODS AND WIRE

BY far the largest suppliers of tie rods and other fittings for aeroplane work are Messrs. W. N. Brunton and Son, of Musselburgh. The rods the firm supplies are both circular and stream-lined, while it also specialises in the manufacture of fine wire cords and high-tension wire, etc. All work is carried out in strict accordance with the various Government specifications.

STURTEVANT ALUMINIUM CASTINGS

THE aluminium castings which are used in the construction of a high-speed motor should be free from all traces of imperfections, such as shrinkage strains, sponginess, chills, scabs, etc. This applies in particular to the crank case, the foundation upon which the entire motor is constructed.

These castings are being produced daily in the B. F. Sturtevant Company's foundry at Hyde Park, Mass. Experts have pronounced them to be equal to any produced in the world at the present time, not excepting those formerly made in Belgium.

The setting up of the cores and the pouring of a V-type motor crank case is without doubt one of the most difficult pieces of work that the foundry has to contend with. The elimination of shrinkage strains in particular is a very difficult problem owing to the fact that variations in cross-section result in an uneven rate of cooling of the metal. The Sturtevant Company as a result of years of experiment in the handling of aluminium have perfected a method whereby these strains may be entirely eliminated. This method consists in brief of using soft cores which are surrounded by thin surface crusts.

It frequently happens that an aluminium casting when subjected to a sudden stress will split or leak under pressure, the latter being due to sponginess. As a general rule the splitting of an aluminium casting is due to chills and cold shuts which are caused by insufficient pressure in pouring the metal, so that in large castings, in particular, the metal becomes too cool to properly coalesce. This difficulty has been overcome by using increased pressure in pouring the metal.

The Sturtevant 140 h.p. motors are being supplied to the U.S. Government, the Russian Government, and to the British Admiralty. Some of these engines are in use at the front at the present time, and are being subjected to more severe use and abuse than they would ordinarily undergo in years of average flying service, yet not a single case has been reported to date where an aluminium casting has broken as a result of being defective.

AIRCRAFT IN ACTION

OFFICIAL INFORMATION

ENGLAND

March 26—Kent Air Raid—War Office announcement: Since Sunday last (March 19) four of the persons who received injuries in the air raid have died, making 13 deaths in all. The total casualties are therefore:—

	Men	Women	Children	Total
Killed	4	3	6	13
Injured	16	3	8	27

March 26—Zeppelin Sheds Raided—Admiralty announcement: An attack by British seaplanes was delivered yesterday morning (March 25) upon the German airship sheds in Schleswig-Holstein, east of the Island of Sylt. [At Tondern, which were reported to have been destroyed by fire some months ago.—Ed.] The seaplanes were conveyed to their rendezvous close to the German coast by an escorting force of light cruisers and destroyers under Commodore Tyrwhitt. Three of the seaplanes which took part in the attack are missing.

(See German official)

March 26—British Aeroplane Missing—One of our aeroplanes which went out yesterday (March 25) has not returned.

FRANCE

March 20—Bombs on Dun-sur-Meuse—During the night of the 19th our bombarding aeroplanes dropped twenty-five bombs on the railway station of Dun-sur-Meuse, where movements of troops on an extensive scale had been reported. All the bombs reached their objects. This morning one of our pursuit aeroplanes drove down in the region of Verdun an enemy machine, which fell in our lines.

March 20—Allied Raid on German Air Base—About four o'clock this morning some British, French and Belgian aeroplanes bombarded the aviation camp of Houttave, east of Ostend. Nineteen French machines took part in the raid, and all have returned safely.

[Houttave is about seven and a half miles from Ostend and five miles from Bruges]

March 21—Enemy Aeroplane Brought Down—To-day one of our pilots brought down a German aeroplane, which fell in flames in the region of Douaumont. Last night (March 20) our aircraft bombarded the railway stations of Dun-sur-Meuse and Audun-le-Roman and bivouacs in the region of Vigneulles.

March 26—German Machine Brought Down—This morning (March 26) one of our pilots brought down a German aeroplane, which fell near our lines in the region of Douaumont.

March 26—Bombs on Bivouacs—During the night of March 25-26 two of our aeroplanes dropped 16 large-sized shells on the enemy bivouacs at Nantillois and Montfaucon.

MESOPOTAMIA

March 20—Bombs on Kut—Turkish Official: "On Saturday (March 18) one of our aeroplanes threw some bombs on Kut-el-Amara and succeeded in hitting a gun and an enemy detachment."

March 24—Bombs on Kut—Turkish Official: "On the night of March 21 our aviators effectively bombarded the enemy's camp at Kut-el-Amara."

March 26—Enemy Bombs on Kut—War Office statement: On March 23 General Townshend reported that his camp at Kut-el-Amara had been bombarded by enemy aircraft and guns at intervals during the period March 21-23. His casualties, however, were slight, and the general situation remains unchanged.

ITALY

March 23—Aerial Activity—Our aeroplane scouting expeditions, ascertaining the presence of considerable rolling stock on the Vallobacca-Idria line, other aeroplane squadrons bombarded Oppacchiasella, Costanjevica, and Nabresina, returning afterwards unharmed to our lines, despite the violent fire of numerous enemy anti-aircraft batteries. Enemy aeroplanes dropped bombs on Asiago and Telvo, in the Sugana Valley, where no damage was done.

BALKANS

March 25—Enemy Machine Brought Down—German official: During a renewed aeroplane attack one enemy machine was brought down after an aerial battle between the enemy lines and our own, and was there destroyed by artillery fire.

GERMANY

March 20—Five Enemy Aeroplanes Lost—Favoured by good observation conditions, the artillery and air activity has been very vigorous on both sides. In the course of air battles Lieutenant von Althaus shot down his fourth enemy aeroplane over the enemy's line west of Lihons, while Lieutenant Boelke shot down his twelfth aeroplane over the Forges Wood, on the left bank of the Meuse. Moreover, the enemy lost three further aeroplanes, one in an air battle near Cuisy, west of the Forges Wood, and two others through the fire of anti-aircraft guns. One of the last fell down in flames near Reims, the other turning over several times in the neighbourhood of Ban de Sapt, close behind the enemy's lines.

March 21—Successful Raid on Kent—On March 19 during the afternoon a squadron of our naval aeroplanes freely dropped bombs

on the military establishments in Dover, Deal and Ramsgate, in spite of the vigorous shooting from the land batteries there and from enemy airmen. Numerous hits with good effect were observed. All the aeroplanes returned safely.

[The last sentence is now known to be untrue.—Ed.]

(See War Office Statement reported in our issue of March 22)

March 22—Three Enemy Aeroplanes Brought Down—Three enemy aeroplanes were put out of action by our aviators in aerial engagements to the north of Verdun. Two of them came down behind our front to the north-east of Samogneux. The third crashed down in flames behind the enemy lines. Lieutenant Boelke has thereby brought down his thirteenth, and Lieutenant Parschau his fourth enemy aeroplane.

March 26—Five British Aviators Captured—Five English hydroplanes ascended yesterday (March 25) morning from two vessels, accompanied by a cruiser squadron and destroyer flotilla. They made an attack on our airship sheds in Northern Schleswig. Not less than three of them, including a battleplane, were brought down by our anti-aircraft section (which had been previously warned) on and east of the island of Sylt. The occupants, four English officers and one N.C.O., were taken prisoners. Bombs were dropped in the neighbourhood of Hoyer-Schleuse. No damage was caused.

(Hoyer-Schleuse is on the coast, eight miles from Tondern)

March 26—Two Enemy Machines Brought Down—Near St. Quentin an English biplane fell into our hands undamaged. After an aerial battle a French aeroplane fell down in the Caillette Wood and was dashed to pieces.



FELIX RUFFY

Instructor at the Ruffy-Baumann School of Flying

FROM OTHER SOURCES

ENGLAND

March 9—South Coast Air Raid—It was stated in our issue of March 8 that a baby met its death through being dropped by a lady who had snatched it up when the house was struck by a bomb. It now appears, as a matter of fact, the child's death was due not to a fall, but to very severe injuries caused by the bursting of a bomb.

March 20—The Allied Raid on Zeebrugge—The *Telegraaf* says that Allied aviators yesterday (March 19) made a reconnaissance on the Belgian coast. At two o'clock this morning (March 20) another aeroplane appeared over Zeebrugge and was subjected to a heavy fire by the Germans. A British squadron appeared at four a.m. and began bombarding the German positions on the littoral. The bombardment was still in progress at half-past eleven, and the German batteries were making a vigorous reply.

On Sunday afternoon (March 19) an aeroplane, which was supposed to have been engaged on a raid on the English coast, returned to Zeebrugge, where every day captive balloons with lookouts ascend to a height of 6,500 ft.

March 20—Three More Deaths from Kent Raid—The death-roll at Dover is now five, a little girl having died in Dover Hospital from injuries received.

One woman was blown off her bicycle by a bomb and injured.

A boy, aged nine, died in Ramsgate Hospital on March 19, making the sixth victim in the town—five children and a man.

A further air raid death has occurred at Dover, making the sixth.

March 22—The *Telegraaf* reports that during the raid on Zeebrugge 34 aeroplanes were clearly visible from the Dutch frontier. Although the Germans have taken every precaution to prevent the leakage of details in regard to the damage caused by the Allies' great air raid on Zeebrugge, a frontier correspondent states on what he declares to be absolutely trustworthy authority that the damage caused, especially to the coast

batteries, was very heavy. A large number of guns were destroyed entirely, and others which suffered serious damage have now been sent back to Essen for reconstruction. Over 200 marines and artillerymen were killed, and the number of wounded must be very great, in view of the fact that one hospital train alone, which passed Ghent station from Zeebrugge, contained over 350 wounded men. It has been ascertained that some German aeroplanes were completely destroyed by the Allies' bombs, while one German aeroplane, which had ascended and became engaged in a fight with a French airman, was shot down by him, the German officer in it being wounded.

March 24—Second Dover Raider Wrecked—Information has come to hand that on Sunday last (March 19) a second German seaplane was brought down during the attack on Dover. During a trip to France a pilot was engaged in taking a new machine to the front, and in passing Dover saw the raid taking place. He had an observer with him in his machine, and he immediately joined in the attack on the German aircraft. It is stated that he was successful, for the machine engaged was brought down in the sea. He then continued his flight to France.

[It is to be noted that no official statement on the subject has been made, as surely it would have been had the facts given above been correct. In fact, the War Office *communiqué* itself was thoroughly vague and most unsatisfactory.—Ed.]



AMI BAUMANN

Instructor at the Ruffy-Baumann School of Flying

HOLLAND

March 21—Dutch Fire on Aeroplane—Dutch troops fired on an aeroplane of unknown nationality which on Monday (March 20) flew over east Dutch Flanders, and seriously damaged it.

March 23—The Zeebrugge Raid—A correspondent on the frontier says that during the recent Allied aerial attack an aerodrome near Ostend and six German aeroplanes were destroyed. At Zeebrugge a German torpedo-boat was towed in by another torpedo-boat. It had six dead and 30 wounded on board.

March 24—Airships Going West—Two airships were seen on Wednesday (March 22) north of Ameland, Holland, going west. The message to the Amsterdam *Telegraaf* announcing this was delayed several hours before delivery.

NORWAY

March 22—Airship over Norway—A large airship was observed last night by the inhabitants of the Norwegian village of Oevrebo, near Christianand. It was only about a hundred metres above the house-tops and was highly illuminated. The airship after using her search-lights took a westerly course over the North Sea. She bore no marks of nationality.

FRANCE

March 6—Captive Balloon Captured—The Dunkirk correspondent of the *Petit Journal* reports that an escaped "captive" German balloon, doubtless detached from its base by the fire of artillery, passed over the town at a very low altitude. Artillerymen started in pursuit, and were able to seize the ropes and bring the balloon to the ground. Two German observers jumped out and attempted to escape, but they were captured.

March 7—Bombs on Metz Forts—Bombs have been dropped by French aviators on Metz forts and on trains with ammunition on the way to the Verdun front.

March 9—French Raid in Belgium—The *Telegraaf* states that on Monday and Tuesday (March 6 and 7) six French airmen bombed the railways and depots in Central Belgium, doing considerable damage.

RUSSIA

March 4—German Activity Behind Russian Lines—The correspondent of the *Observer*, writing from Petrograd, states: "Take the northern front, where there is a curious tremor, as if in anticipation of a coming struggle. German aircraft are constantly appearing over Riga, Dvinsk, and other points in the rear of the fighting line. Sometimes they drop bombs, but bombing is only an incident in their anxious and systematic aerial reconnaissance. The number of German aeroplanes has been increased during the winter, and each division, at any rate on the Dvina, now has its own squadron. The type of machine has

been improved. In the lower part of the body the aeroplane is armoured plated as a protection against shrapnel, more powerful motors are used, and each aeroplane is provided with a machine gun and a larger supply of bombs. Zeppelins are used for scouting as well as aeroplanes.

March 7—Balloons Direct Enemy's Fire—"The enemy's artillery violently bombarded the region south-west of the island of Dahlen (in the Dvina, south-east of Riga), his fire being directed by means of five balloons."

March 11—German Aerial Preparations in Courland—The Germans are paying particular attention to aerial preparations in Courland. The aircraft stations at Libau and Kovno have been considerably enlarged, and a large number of new aircraft were recently brought to a big aerodrome at Radziwizski. At Suwalki experiments have been made in dropping incendiary bombs adapted to the latest type of Zeppelins.

BALKANS

March 7—Raid on Smyrna—The Allies have sent out a number of aerial scouts from Chios, who have brought back the intelligence that the fires started at Smyrna on the occasion of the recent Allied aeroplane raid have not been extinguished, but are continuing their devastation, and appear likely to involve the total destruction of the city. (A notice of the raid appeared in our issue of March 8.)

March 8—Air Fight at Monastir—The correspondent of the *Petit Parisien* at Salonika reports that two German aeroplanes yesterday (March 7) crossed the French lines. They were received with a violent cannonade, and were soon forced to retreat, pursued by two French machines armed with guns, which engaged them south of Monastir. The French aeroplanes returned, and reported that they had not succeeded in bringing down the Germans, but that they believed that one of them had been damaged, as it had come to earth precipitately.

March 8—Air Raid on Ghevgeli—Four French aeroplanes yesterday (March 7) bombarded Ghevgeli, killing and wounding many Bulgarian troops.

March 22—Raid on Mytilene—A telegram from Mytilene says that a German aeroplane from Smyrna flew over there yesterday (March 21) and endeavoured to bomb the Allied warships in the port. No damage was done. The aeroplane, which was fired on, returned to Smyrna.

March 23—Aeroplane Shot Down—A squadron of French aeroplanes while passing over Lake Doiran this morning (March 23), had one of their number shot through by the enemy's guns. The aeroplane fell into the waters of the lake from a height of 7,500 ft. Both the pilot and the observer were killed.

March 25—Air Raid on Enemy Camps—On Thursday (March 23) 22 French aeroplanes flew over the German camps on the Serbian side of the frontier. After successfully bombarding them they were assailed by enemy aircraft. In the ensuing fight one German and one French aeroplane were shot down. The German fell on Serbian and the French on Greek territory. Both the French airmen landed unhurt.

AUSTRIA

March 22—Bombs on Valona—The Austrians state that their aviators on Monday night (March 20) appeared over Valona and successfully bombarded the port and camp.

GERMANY

March 24—Zeppelin Liveliness—In the last two days there has been much Zeppelin liveliness over the North Sea. From the Dutch islands airships have been observed cruising in various directions. A message to hand this evening from Ameland reports the passage of "a great airship" in a westward direction this morning. This wording suggests the possibility of a new and larger type.

LORD MONTAGU JOINS AIR COMMITTEE

Lord Montagu presided at a meeting at the Constitutional Club on Wednesday, March 15, at which Mr. W. Joynson-Hicks, M.P., opened a discussion on the "Need for a Strong Air Service."

Lord Montagu said that when he was asked to attend he had no idea either that the subject would have raised such perfectly well-merited public attention, or that he himself would have loomed so largely in the public eye and been offered, as he had been offered by the Prime Minister that day, a seat on the Aviation Committee. That new responsibility would make him weigh his words with special care.

He had accepted the Prime Minister's invitation solely because he hoped to be able to do some good on the Committee; and he had reasons for saying that he was hopeful that it would be the nucleus of something much wider, more responsible, and much more powerful in the way of a policy of aviation, and possibly eventually lead to an Aviation Minister. He quite realised that these things must come by degrees, and that it was difficult in the middle of a great war to alter the existing system.

After outlining the policy which he described in the House of Lords recently, Lord Montagu said he thought the Zeppelins must be taken very seriously indeed. The greatest of all dangers was Zeppelins accompanying a hostile fleet and being able, at a

distance, to detect strategic movements of our fleet and direct the enemy fleet in such a way as to neutralise our advantage in ships and guns. We must begin to think out a proper Imperial air policy. He said Imperial, because he looked forward to the time when the great Dominions and India would have a common air policy with us.

This weapon of air power in the future was going to be the most important of all the great weapons which naval or military science could put into our hands. After the war Germany might be largely bereft of men; her fleet might be at the bottom of the North Sea; Essen might be blown up, and she might be emasculated for a long time to come. Seventeen thousand aeroplanes cost the same as two Dreadnoughts, and as a Zeppelin cost a great deal less than a destroyer it stood to reason that a nation which had still great scientific ability, but empty pockets, would try to establish a military existence again in a form which would cost the least possible amount of money.

A great responsibility lay upon the Government primarily, and upon the new Committee, to see that the foundations of our Air Service were laid wide and deep. It was giving no information to the German General Staff when he said that we had no dirigibles worthy of the name. In the matter of aeroplanes we obtained supremacy at the beginning of the war. We had lost that supremacy. It would be the duty of the Committee to see that that supremacy was established again at the earliest possible moment. We were asking our pilots, than whom no braver or more gallant soldiers or sailors existed, to fly with inferior machines, and to go up in some cases on missions in which the chances of life and death were far too unequal at present.

CASUALTIES

ROYAL FLYING CORPS

March 13. *Mediterranean* :

WOUNDED

Rayment, 49, A. M., Australian F.C.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR
Insall, Lieut. G. S. M., V.C., R.F.C.

March 14.

WOUNDED

May, 3791 Sgrt. T., R.F.C.

March 19.

WOUNDED

Kirton, Second Lieut. R. I., K. O. Scottish Borderers and R.F.C.

March 14.

MISSING

Barrington-Kennett, Major V. A., R.F.C.

Glover, Second Lieut. B. E., R.F.C.

Grune, Lieut. G. D. G., R.F.A., 4th Home Counties (Howitzer)
Brigade (T.F.), and R.F.C.

Orde, Second Lieut. M. A. J., R.F.C.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR
Champion, Second Lieut. H. F., Rifle Brigade, 6th Bn., and R.F.C.

March 15.

MISSING

Cunningham, Second Lieut. J. C., R.F.C.

Taylor, Lieut. D. P. B., 3rd Hussars and R.F.C.

March 15. *Mesopotamia* :

DIED OF WOUNDS

Faric, Capt. C. A. G. L. H., 1st Highland L.I., and R.F.C.

Undated. Reported from Egypt :—

DIED OF WOUNDS

Girod, Second Lieut. M., 3rd Cheshire Regt., attached R.F.C.

WOUNDED.

Pretyman, Lieut. E. R., 1st Shropshire L.I., attached R.F.C.

ROYAL NAVAL AIR SERVICE

March 24.

INJURED

Bush, Flight-Sub-Lieut., R. E., R.N.

UNOFFICIALLY REPORTED KILLED

Lieut. Herbert Frederick Birdwood, 20th London Regiment, attached Royal Flying Corps, who was officially reported on March 10 to be missing since March 2, is now known to have been killed in an air fight over Valenciennes. He was the only son of Dr. Roger A. Birdwood, late Medical Superintendent of the Park Hospital, Hithergreen, S.E., and Mrs. Birdwood, of Twickenham. Lieutenant Birdwood was educated at Mount St. Mary's, Chesterfield, and the City of London School. He entered Peterhouse College, Cambridge, in October, 1913, and was reading for law. He went to the Western front early in March last year, and was at the taking of Loos in September. In December he was attached to the Royal Flying Corps with temporary rank as lieutenant, and recently gained his first wing as an observer. In the fight over Valenciennes he encountered several hostile machines, in one of which was Immelmann. A message subsequently dropped into the British lines by an enemy airman reported this, and stated that the pilot, Lieutenant C. W. Palmer, was wounded.

Unwin, Major and Squadron-Commander E. F., R.F.C.

Major and Squadron-Commander Ernest Frederic Unwin, Army Service Corps and Royal Flying Corps, died on March 22, at the Queen Alexandra Military Hospital, Millbank, from injuries received while on duty on the night of January 31. Born in January, 1881, he was the third son of the late Rev. C. E. Unwin and of Mrs. Unwin, of 7 Sunny-gardens, Hendon. He received his first appointment

in the Army Service Corps in June, 1904, and in April, 1913, was gazetted to the Royal Flying Corps Reserve. He was promoted to the rank of captain in December, 1913, and on the outbreak of war joined the Royal Flying Corps.

PROGRESS AT THE FLYING SCHOOLS

The Grahame-White School—Report of the progress of pupils at our school for the week ended March 24 : Civilian School—Straights with Instructor—Box and Matthews. Eights with Instructor—Baragar, Butler, Williams, S., Eichelbrenner, Rigby, Sandys, Tanner and Walk. Circuits with Instructor—Holman, Kryn and Leigh. Eights alone—Grasset. Brevet tests—Phillipi.

The Hall School—The following pupils were out receiving instruction. Pupils rolling—Halliday, Dickson, Glegg, Warswick, Osmond, Rayne, Le Grice, Collier, Hucklesby, Duncan. With A. Chave—Longton, Cosgrave, Mahoney, Chapman, Rochford, Neal, Halliday, Smith, all making good progress. With H. Stevens—Ormerod, Arnsby, Lieut. Cooke. With C. M. Hill—Osmond and Taylor. Machines in use—Hall & Caudron Government type tractors.

HONOURS FOR THE AIR SERVICES

FOREIGN DECORATIONS

The King has granted authority for the wearing of the following decorations :—

Officer of the Legion of Honour (conferred by the President of the French Republic).—Major and Brevet Lieutenant-Colonel (temporary Brigadier-General) W. S. Brancker, R.A.

Chevalier of the Legion of Honour.—Engineer Lieutenant-Commander C. R. J. Randall, R.N. (Wing Commander, R.N.A.S.); and Flight Commander (Acting Squadron Commander) H. Delacombe, R.N.A.S.

SOCIAL INTELLIGENCE

A marriage has been arranged, and will shortly take place, between William Henry Dyke Acland, Lieutenant Royal 1st Devon Yeomanry and Royal Flying Corps, elder son of Admiral Sir William Dyke Acland, Bart., C.V.O., and the Hon. Lady Acland, and Margaret Emily, eldest daughter of Mr. and Mrs. Theodore Barclay, of Fanshaws, Hertford.

PATENT INFORMATION

This list is specially compiled for AERONAUTICS by Messrs. Rayner and Co., Registered Patent Agents, of 5, Chancery Lane, London, from whom all information relating to Patents, Designs, Trade Marks, etc., can be obtained gratuitously.

LATEST PATENT APPLICATIONS

- 3,426 A. Austin. Reversible screw propellers for aeroplanes, etc. 8/3/16.
- 3,454 G. Gibson. Airship. 8/3/16.
- 3,362 J. Hurst. Gun mountings for aeroplanes. 7/3/16.
- 3,454 A. E. Smith. Airship. 8/3/16.

SPECIFICATIONS ACCEPTED

- 3,092 Langstaff. Flying machine.
- 3,693 Vasserot. Sighting apparatus for adjusting angles of aim on aeroplanes and automatically correcting errors of verticality.

SPECIFICATIONS PUBLISHED THIS WEEK

- 13,674 Royce and Rolls-Royce, Ltd. Aircraft propellers.

SOCIETY OF MOTOR MANUFACTURERS AND TRADERS

A meeting of the Aero Committee of the above Society was held on March 13, when there were present Mr. H. White-Smith (in the chair), and Messrs. L. Coatalen, F. May, Handley Page, G. Holt-Thomas, and Major Wood. In attendance, the Secretary.

CONTROLLED FIRMS AND EXCESS PROFITS—Reply to communication addressed by this Committee to the Chancellor of the Exchequer was read and a further communication in response was settled. (Members interested in this Section can have a copy of this correspondence on application.)

RAILWAY RATES—Wording of reply to communication from the Board of Trade, conveying the decision of the railway companies not to make any alteration, was settled.

REPORT FOR 1915—Draft was approved for inclusion in the annual report.

THE INSTITUTION OF AUTOMOBILE ENGINEERS

The Sixth Ordinary General Meeting of the Session of the Institution of Automobile Engineers will be held on Wednesday, April 12, 1916, at the Surveyors' Institution, 12, Great George Street, Westminster, S.W., at 8 p.m., when Major B. W. Shilson, I.M.T., A.S.C., will read a paper entitled "From Engine to Axle." This paper is intended as a connecting link between the papers recently read by Messrs. G. W. Watson and W. D. Williamson, and the three papers together cover the whole field of the engine and transmission of the petrol-driven heavy motor vehicle. Cards of invitation to the meeting may be obtained from the Secretary of the Institution of Automobile Engineers, 28, Victoria Street, London, S.W.

AERONAUTICS

A WEEKLY JOURNAL DEVOTED TO THE TECHNIQUE OF AERONAUTICS

(FOUNDED 1907)

Edited by JOHN H. LEDEBOER, B.A., A.F.Ae.S.

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APRIL 5, 1916

[Registered at the G.P.O.]
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ONE PENNY

A NEW TYPE OF ZEPPELINS

WE, in the fancied security of our isles, a security guaranteed by the vigilance and strength of our Navy and its attendant air-scouts, realise but few of the heart-searching trials of war, unless it be by proxy. One has, for instance, to force the imagination in order to realise the feelings and thoughts of the commander of a German submarine and of his crew on setting forth from harbour bent on a predatory expedition in fulfilment of the higher command, knowing full well that close upon a hundred of his predecessors had set out joyfully on similar errands—had set out, but never returned. He knows not when nor where dark fate will overtake him, nor yet in what guise. It may be at his very harbour entrance, or full five hundred miles out at sea; by net or shot or armoured ram or some other one of the countless devices that have been called into being by our fleet and its auxiliaries. Into the darkness of the deep waters he dives, enclosed in a fragile steel cylinder, making straight for his doom.

So, too, with the Zeppelin commander or aeroplane pilot, save only that both know the dangers they affront, except always the peril of the air. England has been suddenly startled into anxious wakefulness by successive Zeppelin raids, which were made on three nights running, under conditions verging upon the ideal. The raiding squadrons on each occasion comprised but a small number of effectives—that of last Friday night was made by three separate detachments working more or less independently, although obviously according to a previously concerted programme—and the military damage they caused was to all intents and purposes insignificant. Yet it may be truly said that no other event in the great world-war, which has cost already millions of lives and is exacting its monthly toll of a quarter of a million or more, not to mention untold damage to property and immeasurable loss of wealth and productive capacity, has more thoroughly stirred the soul of the British people at home, and found vent in the outburst of joy when the news was spread about that one of the marauding Zeppelins had been brought down early on Saturday morning off the Kentish Knock and its crew made prisoners, while the vessel itself was destroyed. Yet all the while the battle of Verdun was raging, a conflict which in all its unprecedented magnitude is like to settle the fate of nations for generations to come, while on the bleak Eastern front proceeds a silent struggle of whose intensity we are as yet but dimly aware.

For months past we have uttered an urgent plea, and reiterated it from week to week, to regard these futile Zeppelin raids, which may fitly be compared to pin-pricks in the hide of a rhinoceros, in their true perspective as episodes in the military clash. We are apt to attach undue importance to them for the simple reason that they reach us more closely at home than any other direct issue of the war. From a broad military point of view they are insignificant. Worse,

for the damage they inflict—not just wrought of malice aforethought, but negligently, and simply in the pursuit of “higher military aims”—is unimportant when compared to the losses the raiders have suffered. And in this respect a curious misconception still appears to prevail. The bringing down of this Zeppelin has been hailed as the first occasion on which our air defences have successfully matched themselves against the Hun raiders. This is far from being the case. Let us recall the facts. On the morning of March 5 of last year a homeward-bound Zeppelin was attacked over the Channel by Flight-Commander Bigsworth, badly damaged by a bomb, and finally wrecked on attempting to land near Tirlemont, in Belgium, a gallant exploit on our aviator's part which, for some mysterious reason, passed almost unnoticed. Exactly three months later Sub-Lieutenant Warneford repeated the same feat, with the only difference that he succeeded in destroying the Zeppelin on the spot. Again, on August 10 last year, a Zeppelin was badly damaged by English anti-aircraft guns, forced to the sea off Ostend, and finally destroyed. Finally, on February 2, a raiding Zeppelin was observed floating half-submerged in the North Sea and appears to have been eventually lost. From these facts it is evident that from the point of view of the Hun—unless he still fondly believes in the destruction of the Liverpool docks and of countless great coastwise fortresses of the Southend variety—these Zeppelin raids have proved a singularly unprofitable business. Let us, therefore, refrain from squealing, and endeavour to acquire a just sense of proportion.

Meanwhile we are mainly concerned with the technical aspects of the matter, which are really of considerably greater import than the wrecking of a Baptist chapel or the singeing of the plumage of a barnyard fowl, facts which were reported in all due seriousness in the columns of the daily Press. For some reason or other the details regarding the Zeppelin craft, LZ 77, brought down by the French a month ago at Révigny, as published in various newspapers, and duly republished in some of our contemporaries, were, if not deliberately misleading, at least grossly inaccurate. The airship in question, as its factory number indicates, was quite a recent production; nevertheless, it was of comparatively small tonnage—considerably smaller than any naval airship ever built—while its fuel capacity was extremely limited. Recent information goes to show that the Germans are now building two distinct types of Zeppelins; the larger number are naval craft of capital size, cubing some 30,000 metres, while the other class comprises powerfully engined craft of moderate tonnage, capable of a high turn of speed, but with limited buoyancy, and therefore incapable of carrying heavy loads and devoid of rapid climbing powers. The latter class of craft would appear to be intended chiefly for short bomb-dropping excursions by land. There is some reason to believe that the Germans are not alone in developing this type of airship.

J. H. L.

RECOLLECTIONS OF AVIATION IN THE ARGENTINE AND CHILE

By HUBERT F. FISHER, of the Argentine Aero Club

(Continued from page 193)

THE Argentine Naval Air Service is still practically in its infancy. On October 16 of last year this service lost its only machine and its only qualified aviator, namely, Joaquin Oytaben. This unfortunate aviator, who had only recently been appointed instructor of the newly-formed Naval School, was practising alone on the school machine—a M. Farman land type (50 h.p. Gnome)—when at a height of about 200 metres the machine was caught in several strong gusts of wind, the last one affecting the machine, which was then very much down on the left wing, so much that the pilot was thrown right out. He was found at a distance of 240 feet from the completely smashed machine. Oytaben was fearfully injured, and died almost immediately. Orders had been placed in Europe many months before this occurrence for two new powerful hydro-aeroplanes for this branch of the Navy, but up to date they have not been delivered. Lieutenant Raoul Moreno,

ceeded in training a small number of pupils who obtained their tickets, but when the great war broke out Paillete went at once to France, his native land, where he is still flying, and enjoying it according to his last letter. I certainly hope he is still well, as he was a fine fellow. He left the school in the hands of a firm, who have managed to keep it going with the aid of E. Rogers, a young French-Argentine aviator, as director, and Albert Jarfelt as instructor, turning out by now about twenty-five certified pilots on the old H. Farman. The school has built various machines of the Farman racing type, which have flown quite successfully. These machines are very light and fast. In Jarfelt, as instructor, the school is very fortunate; a more conscientious and in every sense of the word "chivalrous" teacher it would be hard to find.

Of the other schools, that of Pablo Castaibert merits notice, as he teaches upon monoplanes of his own construction. These machines are well worth noticing. His last machines had the following general dimensions:—Height from ground to top of cabane, 2.60 metres; length from propeller to rudder, 6.50; between wheels, 1.60; distance between wing tips, 5.07 metres; length of fuselage, 5.85; width of wings, 1.96; total wing surface, 20 metres; angle of incidence, 7 deg. The machine has dual control, the seats being arranged side by side; powered with a 100 h.p. Gnome 14-cylinder engine; propeller diameter, 2.50 metres by 2 metres pitch. This machine is very well finished, and should be splendid for school work.

The third school of importance is that of Dosse Obligado, in Longchamps, near Buenos Aires. This school has only been open a short time, and so far has not returned many certified pilots.

Whilst on the subject of flying schools it is worth while noting that a very sensible step was taken by the Argentine Aero Club in December last. In view of the fact that many machines in use in the schools are very old, in some little remaining of the original machine, it was decided that at least once a month an inspection of the school material and machines should be made by certain members of the committee of the Aero Club. This was a very wise move, as undeniably there was more than one machine at that time in such a condition that flying it was dangerous. Engine failures were too common to be healthy. Lack of power owing to worn-out engines was the principal cause of trouble. Some box-kites had to be kept in the air almost by the will power of the pilot. To climb a few hundred feet for a joy ride with the tail dropping through lack of propeller draft is no joke. Tail planes and rudders, etc., saturated with oil and mud, with a sick engine, do not help much either. On "heavy" flying days some of our flights at the start were more like steeplechasing. Flying just off the ground, a stiff hedge had to be negotiated; after lifting the machine over this, perhaps a few grazing cows would appear in the path, might be passed over safely if they would only keep on grazing instead of lifting their heads to see what is coming, thus bringing their horns another two feet in the air. Having passed over these without having a wheel "strafed," the main object was to get sufficient altitude to be able to turn without coming down. However, there were always more laughs than tears in the aerodromes, in spite of our troubles. After this inspection rule came into force, things were much better. It was understood that schools whose machines were not passed by the examiners would not have the right to call upon the Aero Club to grant tickets to their pupils.

Shortly after this it was also decided by the Aero Club that the examinations for a pilot's certificate should be



MR. HUBERT FISHER AND HIS WIFE

the director, was in January of this year considering the possible purchase of an old Déperdussin monoplane that had once been a hydro-aeroplane and once had landing wheels fitted on. This machine has an 85 h.p. Anzani engine, and, although it has had considerable use in different part of South America, it might still be used for school work.

Regarding the civilian schools in the Argentine, there are only three that amount to anything. The school that has the best record for teaching is the San Fernando Aerodrome in San Fernando. This school was started by Marcelo Paillete and Teodor Fels. Fels almost immediately retired, leaving Paillete alone. Paillete had an uphill fight—funds, as usual, being the enemy. However, he suc-

carried out in a much stricter manner than before. This was done owing to the large percentage of fatal accidents that had occurred in the Argentine in recent years, which the Aero Club thought might have been avoided if the pilots had been more experienced and not been given their tickets before they were fit to have them. At present, under the new regulations, only the committee are allowed at the "pylons" during the examination of a pilot, and the official time he makes his "eights" is not known to him until after the next committee meeting; even if he completes the examination as per the rules of the F.A.I. the ticket is not granted unless the committee are of the opinion that the aspirant can fly properly.

This resolution was passed at the last meeting over which Señor Ernest Newberry, as President of the Argentine Aero Club, presided. Señor Ernest Newberry, brother to the late George Newberry, although not a very enthusiastic flyer himself, has always shown great interest in this sport, and, as President of the Argentine Aero Club, was responsible for many of the advances made by the club during that year. The new President is to-day Ingro



FARMAN BUILT IN THE ARGENTINE

A. R. Mascias, whose picture was published in my last article. Undoubtedly he is absolutely the right man at this time, when aviation in South America is just going to start very strongly. Señor Mascias has done a lot of fine flying in past years, he is a qualified engineer, a fine aviator, and a good all-round sportsman.

For some months past there has been projected the idea to organise a Pan-American Aeronautic Association. The Chilean Aero Club were the originators of the scheme, the object being to form a union between the Aero Clubs of Chile, the Argentine and Brazil, and any other Aero Club

of the South American continent. The conference was arranged for March 9, 1916, in Santiago, Chile, and the organisation to be called the "Asociacion Aeronautica Pan-Americana." So far we have no news of the results of this conference. Undoubtedly great things will come of this in the South American aviation world.

Ingro Mascias, as President of the Argentine Aero Club, will be just the man to look after the Argentine end. Curiously enough, word has just come across of a new Federation formed by the Aero Club of America in conjunction with the Aero Clubs of Argentine, Brazil and Chile. This is to be called the Aeronautic Federation of the Western Hemisphere.

The object of both these organisations is almost identical, being to foster and further the interests of aviation in all its different connections.

At the back of the A.A.P.A. there is nothing but a true sporting instinct, whereas I cannot help but think that the A.F. of the Western Hemisphere have for their part object the capturing of the South American aviation business, where, up to the present, no North American aeroplane has yet penetrated. Some years ago Curtiss sent a flying boat to Brazil, but I think this met with a bad accident in the harbour of Rio de Janeiro; certainly no further business resulted. In any case, whether both or one only of these two organisations gets going, there is certain to be a much bigger movement in the South American aviation world in the near future. Big prizes are already offered for long-distance raids, and probably another attempt will be made to fly over the Andes from Argentine to Chile. The man who succeeds in this crossing, whether by aeroplane or balloon, is going to make a very big name for himself and probably a big pile of money, too. Eduardo Bradley, an Argentine, proposes to make the attempt this or next month in a balloon. He calculates that a height of 23,000 ft. is necessary to make the crossing, and that no aeroplane engine at that height would have the power left to dominate the strong winds that always blow from the west. These are the winds that blow from the Pacific coast over Chile to the Andes and over to the Argentine. Bradley has been studying this proposition for over two years, during which time he has made many ascents in balloons. Only as recently as last October he, with Lieut. Zuluaga, Argentine Army, left Buenos Aires by balloon, crossed the River Plate, right over the country of Uruguay, and landed near San Leopoldo, in Brazil, covering a distance of 980 kilometres in eleven hours; this is a record distance for South America.

There are only two lady aviators in the Argentine, the first to get her ticket being "La Feguerero" in October, 1914. The second is Señora Jarfelt, wife of the instructor at the San Fernando school. This plucky little woman has also looped the loop as passenger with Domenjoz on two occasions.

ANTI-AIRCRAFT GUNS IN U.S.A.

ADMIRAL STRAUSS recently told the Committee on Naval Affairs of the House of Representatives of the designing and construction of a new type of anti-aircraft gun, larger than an automatic—a shell-firing gun. There are enough automatic guns on hand now to supply all the aircraft that will be brought in the service with the expected \$2,000,000 (£800,000) appropriation. High-angle-fire guns will be used on such submarines as will be armed with guns, and ultimately destroyers will have one-pounders. The deduction of \$1,274,000 (£255,000) from the Estimates for anti-aircraft guns may take out of the Navy entirely for a year the purchase or manufacture of these guns, if some money cannot be found under "ordnance and ordnance stores." Admiral Strauss put in his Estimates the above sum for anti-aircraft guns, gave the reason for them to the Secretary of the Navy for the appropriation; the Secretary, in the fulness of his knowledge, has stricken it out.

U.S.A. NAVAL AIR SERVICE

A MACHINE of 50,000 lb. weight is in the vision of Captain Mark L. Bristol, Director of the Office of Naval Aeronautics, and there is already the report of aeroplanes with 1,000 horse-power. Captain Bristol advises that aircraft be treated as a new type of warship and handled by officers detailed for such duty, and not by a flying corps of civilians. He would have a reserve of trained officers and men supplemented by an organisation of manufacturers and material producers. A mobile fleet of eighty-two aeroplanes, five dirigibles, and forty-one balloons should be immediately provided at a cost of \$13,670,000 (£2,754,000), with a personnel of 430 officers and 852 men, to meet present requirements, to be ultimately increased to 638 officers and 1,200 men. There are now nearly ready for delivery one dirigible, twenty-three aeroplanes, sixty-four motors, and twelve competitive motors.

AVIATION IN FRANCE

[FROM OUR PARIS CORRESPONDENT]

AERO activity in the region of Verdun is the chief topic at present. It is reported that there have been some French machines out every day since the attack began, not excepting days when it snowed almost constantly. To be of service regulating artillery fire, it has been necessary to fly low enough to be in range of muskets and maxims, but bull's-eyes by the enemy have been so scarce as to be almost negligible.

The bad weather did keep most of the machines on the ground, German and French alike. Not that the weather prevented the men flying, but rather rendered aeroplanes of little service. On March 8 the sun shone. The *communiqué*, March 10, briefly tells some of the consequences. Fifteen German machines chased out of the way; at least eight of them definitely brought down. It is significant that the combats referred to took place back of the German lines. This indicates that German aeroplanes of *barrage* were not totally successful in barring the way to French reconnaissance machines and aeroplanes of the chase. The former evidently were successful in penetrating the enemy's territory to report activity in the German rear, taking advantage of the first favourable weather in many days for high altitude reconnaissance. The French chasing planes were cut in force. After days of waiting, skilful duellers on monoplane Nieuports apparently attacked the German aeroplanes, working on *reglage* behind their own lines for long-range guns.

The *Echo d'Enghien* says, on March 11: "A French dirigible, quite new, carrying in the rear the three colours painted on the rudder, flew over the lake on last Wednesday." The next day it was seen over Paris, passing the Place de l'Opéra twice at low altitude. The Astra company is producing these very practical looking ships with commendable regularity, and on fine days their appearance over Paris and suburbs for their trials is no longer novel.

The *communiqué* of March 13 speaks for the first time of "our army corps aviation" and "battle" aviation. Is this an indication of the tendency of French military aviation that will eventually make "battle aviation" a separate arm of the service, with aviation of the army corps integral with the arm by which it may be employed? If so, we may then look forward to the day when there will be a higher rank than *sous-lieutenant* of aviation, even aviation generals, and at the same time such titles as "pilot-aviator of artillery," of "lieutenant-pilot-aviator of infantry."

The Ministry of Aviation did not prove successful in France, but it is probable that M. Besnard did not have the herculean qualities that were necessary to such an office still-born in the time of the greatest war. This failure has given pause to the transformation of aviation into a separate arm, but it is nevertheless moving automatically towards that end.

The principal characteristics of LZ 77 were apparently as follows:—*

Total capacity of gas bags—1,130,072 to 1,165,387 cu. ft.

Maximum length of envelope—about 600 ft.

Maximum diameter from top of envelope to bottom of nacelle—62 ft.

Four or five Maybach motors—each of 180-220 h.p.

Five wooden propellers—16½ ft. diameter.

Motor consumption of gasoline per h.p. hour—less than 1-2 lb.

Oil consumption, each motor per hour—5½ lb.

Weight of each 180-220 h.p. motor—

Load of explosives carried—3,000 to 3,300 lb.

Normal travelling altitude—5,900 to 6,500 ft.

Maximum altitude (estimated)—9,800 to 10,500 ft.

Crew—not less than 23 men.

With the advent of fine weather, Sunday, March 12, brilliant sunshine—that changed atmosphere of springtime which touches poets and aviators with equal influence—aerodrome activity redoubled. Consequently we have to deplore an unusual number of accidents. Three dead Sunday, one seriously injured; two dead Monday, three seriously injured. The latter, who may not live, were English, hurt under unusual circumstances "at the Allonville aerodrome near Amiens." It is reported that a captain in an effort to advise the pilot of a machine in the air that a wheel had been lost from the landing gear in getting off, collided with the machine, and both planes, three men, came down in a heap from 600 ft. An attempt had previously been made to signal the trouble to the pilot of the machine by the use of fusees, but without success.

Now that most aerodromes and the air above them are crowded beyond safe capacity, strict flying rules and simple signals for all possible emergencies is as important a matter as training pilots. It is rather futile to produce pilots without taking every precaution to prevent the aerodrome accidents for which there is always traceable cause.

Americans are participating more and more in the aviation side of the war. Some, discovering Canadian ancestry, joined the R.F.C. and the R.N.A.S.

The rising of the waters of the Seine seriously inconvenienced many builders, notably the F.B.A. But the Seine obliged, and is still going down slowly. The additional water has nicely widened the Seine for flying boat tests, but there is none too much room for getting off between the bridges. Yesterday I was pleased to see an F.B.A. in the air for altitude. One cannot publish records these days, but the boat climbed until it was a nearly invisible speck in the cloudless sky.

* The figures given by our correspondent do not tally with the information in our possession, which has been derived from an exceptionally authoritative source.—Ed.

THE ZEPPELIN RAIDS

Taking advantage of the extraordinarily propitious conditions of wind and weather, conditions which over a similar length of time are not likely to recur again this next twelvemonth, the Huns have, up to the moment of writing, made three successive nocturnal Zeppelin raids on our coasts. The combination of favourable conditions consisted in a high and, above all, steady barometer, an almost total absence of appreciable wind, hazy weather, and absence of moonlight. In regard to the first of these conditions, it is often assumed that the Huns, lacking weather reports and barometric readings from our western coasts, and especially from Ireland, are unable to evolve a reliable weather forecast. Such, however, is not the case, for reports from the British Isles are by no means essential, while reports are available from Iceland, Scandinavia, and other neutral countries; moreover, it should be remembered that the German meteorological service is the most efficient in the world, and that since their occupation

of Belgium, including a portion of the North Sea littoral, the Huns have established a network of meteorological stations throughout the conquered territory.

And on the whole, however imposing these three successive raids may collectively appear to be, their results in their meagreness have only served to confirm the very poor opinion of the Zeppelin craft as a weapon of offence which previous raids led us to form. Moreover, the enemy, with everything in his favour, has made singularly little use of his opportunities. For instance, despite the ideal conditions, he has not sought to send raiding aeroplanes against our Channel coast. Of course, there has been the usual toll of innocent life, the inevitable and senseless damage to innocuous civilian property. But throughout the course of nineteen months of war the enemy has not yet once succeeded in doing one atom of damage which even by an inordinate stretch of the imagination can be described as of the

remotest military significance. Were it not for the scouting value of their airship fleet the Germans might never have possessed a Zeppelin and the course of the war would not have been altered by one iota. In this respect the following remark of the commander of the wrecked Zeppelin to a correspondent is of great significance. He said: "You must not suppose that we set out to kill women and children. We have higher military aims." Whereupon the correspondent in question ventured to point out that with all their raids they had not been able to destroy anything of military value, a statement which the Hun flatly refused to believe. From this point of view the German version of Friday's raid is highly diverting. Restrictions of space prevent us from giving any but the official statements concerning these raids.

April 1, 1.25 a.m. War Office report:

An air raid took place last night over the Eastern Counties, in which five Zeppelins are believed to have taken part.

All the raiders crossed the coast at different places and times, and steered different courses.

At present about ninety bombs are reported to have been



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LIEUT. BRANDON, R.F.C.,
Who bombed the Zeppelin

dropped in various localities in the Eastern Counties, but the results are not known.

It is further reported that hostile aircraft have visited the North-East Coast, but no details have yet been received.

10.55 a.m. Admiralty report:

During the night a damaged Zeppelin was observed to come down off the Thames estuary; on being approached by our patrol vessels she surrendered; the crew were taken off her, and she was taken in tow, but she subsequently broke up and sank.

4 p.m. War Office report:

It has now been ascertained that the Zeppelins which carried out the air raid last night were organised in two squadrons and one detached ship.

The two squadrons made the Eastern Counties their objective, while the detached ship raided the North-East Coast.

As far as is known at present, 54 explosive and incendiary bombs were dropped in the Eastern Counties and 22 on the North-East Coast.

The Zeppelin reported by the Admiralty to have fallen into the sea was the *L15*. She was hit by gun-fire while over the Eastern Counties, the shell striking the upper part of the ship near the tail. After being hit she quickly dropped to a lower

altitude, well down by the tail, and finally came down into the sea off the coast of Kent. A machine-gun, some ammunition, a petrol tank riddled with shrapnel, and some machinery were dropped either by this vessel or by another of the raiders.

Owing to the damage to telephone and telegraph wires caused by the recent storms, it has not yet been possible to ascertain fully the casualties or the damage caused. The casualties at present reported amount to 28 killed and 44 injured.

April 2, 6.30 p.m. War Office report:

Two airships approached the North-East Coast last night. Only one crossed the coast, the other having turned back.

As far as is at present known 16 persons were killed and about 100 injured.

Eight dwelling-houses were demolished, and a serious fire was caused in a french-polishing shop.

7.40 p.m. War Office report:

The total casualties reported as a result of the Zeppelin raid on the night of March 31-April 1 now amount to 43 killed, 66 injured.

Nearly 200 explosive and incendiary bombs were dropped.

A Baptist chapel, three dwelling-houses, and two cottages were demolished, and a town hall, four dwelling-houses, 35 cottages, and a tramcar shed partially wrecked, but no military damage was caused.

A number of our aeroplanes went up to attack the raiders.

Lieutenant Brandon, R.F.C., on rising to 6,000 ft. at 9.45 p.m. saw a Zeppelin about 3,000 ft. above him. At 9,000 ft. he got over it and attacked, dropping several bombs, three of which he believes took effect. At 10 p.m. he got over the airship again and let off two more bombs over her nose. His own machine was hit many times by machine-gun bullets.

This may have been the Zeppelin which dropped the machine-gun, ammunition, petrol tank, and machinery, or possibly that which came down off the Thames estuary.

April 3, 1.15 a.m. War Office report:

A Zeppelin raid took place last night, when the coast of Scotland and the Northern and South-Eastern Counties of England were attacked. Bombs were dropped at various places, but no details are at present forthcoming.

A further communication will be issued later.

The following is the amusing German wireless version of the first raid, dated April 2:

German Main Headquarters reports this morning as follows: During the night of March 31-April 1 one of our airship squadrons attacked London and the South Coast of England. Bombs were freely dropped on the City between the Tower Bridge and London Docks, the military camps in the North-Western district of the City, the manufacturing works near Enfield, and the munition works at Waltham Abbey.

Another airship, after having successfully attacked a battery near Stowmarket, dropped a number of explosive and incendiary bombs on Lowestoft.

A further battery was silenced near Cambridge, the extensive manufacturing works of the town were attacked, and bombs were finally dropped on the fortification works and harbours on the Humber, whereby three batteries were reduced to silence.

All the attacks were successful, and reliable observations from the airships discerned the presence of numerous fires and the collapse of buildings.

In spite of violent bombardment all the airships returned, with the exception of *L15*, which, according to a report, was compelled to descend in the water of the River Thames. Searches instituted by our naval forces have up to the present not been productive of any result.

NOTE.—We are officially informed that this account is absolutely false in every particular, except that relating to the destruction of *L15*.

Lieutenant Alfred de Bathe Brandon took his ticket at the Hall Flying School at Hendon on October 17 last year, joined the R.F.C. last December, and was appointed a flying officer under date February 24 this year.

AMERICAN RECORD MAN KILLED

Grinnell, Iowa, March 11—W. C. Robinson, an aviator, was killed this afternoon when his biplane, in which he was trying for an altitude record, fell from a height of 13,000 feet. As the machine struck the ground the petrol tank exploded and the resultant fire destroyed the plane and burned the aviator's body almost beyond recognition. The accident occurred near Ewart, Iowa, ten miles from this city. Robinson was thirty-two years old, and is survived by his wife and four children. Robinson was the holder of the American record for cross-country non-stop flight, which he won a year ago, flying without a stop. (See AERONAUTICS, March 1, 1916, p. 144.)

AEROS OFF TO BORDER OF MEXICO

San Antonio, Texas, March 13—The aero squadron, commanded by Captain Benjamin D. Foulois, departed this morning on a special train for El Paso. There are eighty men in the squadron, including mechanics and Signal Corps enlisted men. The train, composed of nineteen cars, carries six aeroplanes and tent hangars, twenty-five quick-firing guns, and 65,000 rounds of ammunition.

STATEMENTS IN PARLIAMENT

HOUSE OF COMMONS

March 21—*Admiralty and Aviation*—Mr. Brookes (U., Mile End) asked the First Lord of the Admiralty whether he had considered the advisability of appointing a naval flying man as a member of the Board of Admiralty, more especially in view of the action of the War Office in nominating a member of the Royal Flying Corps to a seat on the Army Council.

Mr. Balfour: In the case of a Service so new and so rapidly growing, and of whose possibilities no man can speak with confidence, it would be foolish to pretend that we have reached the final organisation. The subject is too large to be dealt with by question and answer.

Naval Air Service Expenditure—In reply to Mr. Brookes (U., Mile End), Dr. Macnamara (L., Camberwell) said: The desirability of showing the expenditure on the Royal Naval Air Service separately in the Navy Estimates has been under discussion between the Admiralty and the Treasury, and it has now been decided that, so far as *matériel* is concerned, Air Service expenditure will be shown under a separate group of sub-heads in Vote 9—the Armaments Vote. The cost of *personnel*, works, etc., will still be dealt with under their appropriate votes. For 1916-1917, however, it is not proposed to give any detailed estimates of the expenditure involved, the votes presented to Parliament containing only token figures. I am afraid, therefore, it will not be possible, neither would it appear to be in the public interest, to discuss the details of actual air expenditure at the present time.

Air Raid Warnings—Mr. Joynson-Hicks (U., Brentford) asked the Under-Secretary for War a question of which he said he had sent him private notice, on behalf of the civic authorities on the South-East Coast. It was whether he would arrange that the moment warnings of air raids were received by the military or naval authorities they should be communicated to the civil and police authorities in the neighbourhood; whether under the regulations for the Defence of the Realm military authorities only were allowed to give public warnings of air raids; whether, in connection with the raid on the South-East Coast on Sunday last the sirens were not blown until after the raid had taken place; and whether he would arrange that the civil authorities should have power to give the necessary public warning.

Mr. Tennant said the hon. member's notice had not reached him. All he could say was that there was not only every intention to do so, but as far as he knew it had been carried out and warning was given to all those concerned.

Mr. Joynson-Hicks said he had posted the letter to the right hon. gentleman at the War Office.

Mr. Long (President, Local Government Board): With regard to the Air Committee, it was working vigorously and effectively. It was not desirable to state the changes which were being made and the steps which were being taken, but the Government were doing their best to overtake time which might have been lost and to put the country in a thoroughly satisfactory condition in regard to this new method of warfare.

March 22—*Attacks on Hostile Aircraft*—Dr. Macnamara (L., Camberwell), replying to Mr. R. M'Neill (U., Kent, St. Augustine's), said that in the event of hostile aircraft being sighted at places where aeroplanes of the Royal Naval Air Service were in readiness, it was not necessary to obtain sanction from the Admiralty before such aeroplanes were allowed to go up to attack the invader.

Warning Notices—Mr. Joynson-Hicks, alluding to the question of air raids, said that the whole of the South-East Coast was particularly open to such attacks, and every possible assistance should be given to people who bore the brunt of them. The only question between them and the War Office at the present moment was as to the giving of notice of the approach of aircraft—whether the notice which was given by the blowing of a siren should be given by the civic authorities immediately, or whether they were to wait until the naval and military authority woke up and permitted the sirens to be blown. He said that recently a German airship went to Cliftonville, Margate, dropped bombs there; and, though it had been sighted by the aircraft patrol, the Admiralty had to be communicated with before the Westgate station could be warned. Notwithstanding that, Lord French had declined to allow warning to be given except by the naval authorities. On the raid of February 14 last a warning telegram was not received by the Ramsgate police authorities from the Broadstairs police until 7.37 p.m., although the information it contained was known to the naval officer at 6.20. In the raid of last Sunday the airship which appeared off Dover at 1.57 reached Ramsgate at 2.10. At 2.15, after the bombs had fallen, permission was given by the naval authorities for the siren to be sounded. No one was allowed to blow the siren until the orders had been received from the naval and military authority. The result of the delay in this case was that the lives of a number of children were sacrificed, because had the warning been given earlier the children would not have been allowed to go to Sunday school. He had been told that the officers in control were away at luncheon at the time of the

raid, and that no subordinates were left in charge. The Under-Secretary for War had stated recently that soldiers and sailors were entitled to fire at hostile aircraft. But evidence was accumulating that the naval and military authorities were not aware of those orders.

March 23—*Airmen as Clerks*—Replying to Mr. Pemberton Billing (Ind., Herts, E.), Dr. Macnamara (L., Camberwell) said since the establishment of the Air Department it had been necessary to employ trained pilots in the administrative work of the Department, in the same manner as, for instance, qualified gunnery and torpedo officers were employed in the Naval Ordnance Department. The Admiralty fully recognised the importance of not withdrawing pilots from the active work for which they had been trained, and this point was kept constantly in mind.

Mr. Pemberton Billing asked whether it was a fact that 130 pilots had been employed at the Air Department in clerical work owing to the scarcity of clerks. Dr. Macnamara replied that he did not think it was the policy to employ them on purely clerical work to any extent. Certain of the officers had, as the hon. member knew, been engaged in the dangerous work of testing new machines. Some were medically unfit, having been incapacitated by accidents. In any case, the whole question was one that would certainly be kept in view.

Sir H. Dalziel (L., Kirkcaldy) asked whether the First Lord was aware of the fact that so many pilots were employed as clerks when he said there was a shortage of pilots.

Sir A. Markham (L., Mansfield): Is it true that 130 of these people have been employed as stated by the hon. member?

Dr. Macnamara: He did not say 130.

Sir A. Markham: Yes, he did.

Replying further to Mr. Pemberton Billing, Mr. Lloyd George said he would not like to state without notice whether it was proposed that the duties and powers of the Air Committee should be increased.

The Zeebrugge Raid—Mr. Pemberton Billing asked whether the First Lord of the Admiralty could give an assurance to the House that the Allied raid on Zeebrugge was not, so far as this country was concerned, an isolated and sporadic act of offensive air warfare, but was part of a well-considered plan for vigorous and repeated attacks on enemy aircraft bases and other points of strategic importance.

Dr. Macnamara replied that the Government had every intention of using to the utmost the air resources at their disposal for offensive as well as defensive operations.

March 28—*Air Raids and Gun Defence*—Mr. Pemberton Billing, having asked whether, since a recent raid on the North-East Coast, any special guns had been erected on the roof of a certain municipal building in a North-East Coast town,

Mr. Tennant said: The mounting of guns for defence against aerial attacks is not a subject on which information can be given in the most public manner possible—i.e., in an answer to a question in this House.

Mr. Pemberton Billing asked whether, without injury to public interests, information could be given as to the mounting of wooden guns, and Mr. Tennant replied that he did not think it could be.

Casualties to Airmen—Answering Mr. Bennett-Goldney (U., Canterbury), Mr. Tennant said: There were three casualties to officers of the Royal Flying Corps during the recent Zeppelin and aircraft raids. The injuries were not due to the action of the enemy, nor to any cause which was, at the time they were incurred, preventible.

The Derby-Montagu Committee—Mr. Tennant, replying to Mr. Bennett-Goldney (U., Canterbury), said: I understand that the hon. member for East Herts was asked to give evidence before the Committee presided over by Lord Derby. He replied that no useful purpose would be served until this House had satisfied him upon the powers and authority of the Committee. No invitation has been given to him to become a member of or adviser to the Committee.

Hostile Aircraft Warning—Mr. J. A. Pease (L., Yorks. W.R., Rotherham) informed Mr. Cowan (L., Aberdeenshire, E.) that additional telephones were being installed in munition factories and other establishments for the communication of warnings of the approach of hostile aircraft in order that the necessary steps might be taken to comply with lighting and other public regulations for safety.

Ramsgate Air Raid—Lieutenant-Commander Dudley Ward (L., Southampton) drew attention to a speech made by Mr. Joynson-Hicks last Wednesday, in which officers in authority at Ramsgate were charged with neglect of duty during the air raid of the previous Sunday, with the result that a certain number of lives had been lost which otherwise might have been spared. Referring to the statement that in February last the naval authorities had notice that a Zeppelin was in the vicinity at 6.20 in the afternoon and that they did not inform the police at Ramsgate of the danger until 7 or 7.30, he said the explanation was that the Zeppelin was going in the other direction. People were only warned in districts towards which the Zeppelin was

going. As to last Sunday week, six minutes after the aircraft were observed over Dover, which was 20 miles away, aircraft were observed over Ramsgate, and as soon as it was certain that they were enemy aircraft, the order to blow the alarm was given. He believed the hon. member's complaint was that when the aircraft were observed over Dover warning was not given to the inhabitants of Ramsgate. It did not follow that because the enemy aircraft was over Dover it would go to Ramsgate. In fact, different aircraft attacked Ramsgate. The hon. member said that aircraft were observed approaching Ramsgate at 2.10, and that at 2.15 the attack was over. That did not allow much time for giving notice. In point of fact, he believed the time was slightly longer and that the raid lasted about nine minutes. The assertion that the officers in authority were at lunch and had left no subordinates in charge had not the slightest foundation and was absolutely contrary to the fact. At the naval station at Ramsgate there were responsible officers, whose duties were to keep watch, and at no time from the beginning of the war had a responsible watch-keeping officer been out of duty. He thought he knew where the hon. gentleman got his information. After the raid the Mayor came post haste to London and tried to see somebody in authority. It was Sunday. Eventually he found the hon. member, who, without taking any steps to verify the story told him, made these charges.

Mr. Joynson-Hicks (U., Brentford) said that before this raid, owing to the member for Thanet being on service, he had been approached by the inhabitants of that division. He saw two Mayors of adjoining towns, and he had since had confirmatory letters from the Mayor of another town in the district. He had taken, and was taking, every possible means to inquire into the truth of these statements. He had told the House that no siren was blown till after the whole of the bombs had been dropped, and he took every possible means to satisfy himself that that was correct. He had in his possession a report from the engineer of the borough of Ramsgate. The siren was blown within ten seconds of the telephone message from the naval authorities giving permission for it to be blown, and the raid was over by the time the siren was blown. His hon. and gallant friend said that warnings could not be sent to everybody at once, but on the occasion in question it took an hour and seventeen minutes to warn the towns in turn, and poor Ramsgate did not get its turn until an hour and seventeen minutes after the aircraft were first seen. It was the duty of the naval and military authorities to warn all places whenever there were hostile aircraft within thirty miles. He was accused of having made most unfair charges against the officers of the aircraft service at Ramsgate; but he was prepared to read statements made by the councillors and burgesses of Ramsgate. There were three principal naval authorities at Ramsgate, Captain Tomlin and two lieutenant-commanders. He had absolute proof that firing was heard off Dover and Ramsgate long before the raid took place, and he affirmed that as soon as firing was heard off the coast it was the duty of one of these officers to be at the office to receive telephonic communications and any necessary orders.

Mr. Marshall (L., Wakefield) was persuaded that it was the system of watching for aircraft in the Isle of Thanet that should be criticised. He had been a spectator of at least three air raids, and he had come to the conclusion that it was of the utmost importance that the observation posts should be properly chosen, and that the latest information should be sent to the places from which remedial measures could be taken.

MR. PEMBERTON BILLING AND MR. TENNANT

Mr. Pemberton Billing (Ind., Herts, E.), replying to the challenge of the Under-Secretary for War, with reference to his speech last week, said the right hon. gentleman made a rather passionate attack upon him, instead of what he suggested would have been better, a dignified and complete denial to his charges, instead of replying simply to the one dramatic note he struck on the question of our pilots being murdered rather than killed, owing to their being asked to accomplish tasks which the machines were incapable of accomplishing.

Since his speech in the House last week he had been inundated with letters from gentlemen anxious to support him with documentary and oral evidence. While it was not his present intention to mention names, he was perfectly prepared either to place the evidence he possessed, which contained names in all cases, on the table of the House, or to show it privately to any member in the Lobby.

He proposed to read extracts from several letters received by the father of one of our gallant officers who had since, quite recently, met with one of the regrettable accidents he had referred to, in which he unfortunately lost his life, thus robbing the country of one of our most capable airmen. The accident in question was as follows:—"The officer was so dissatisfied with the machine, which had recently been repaired, that he would not allow any pilot under him to fly that machine unless he personally proved it." The proving cost him his life. The same officer before his death wrote from Dover to his father as follows:—"It is not only a war flight base, but a school." This officer also stated, referring to the Dover aerodrome, and he could substantiate the statement from personal experience:—"This is a very devil of a place to fly in. The aerodrome is situated on the top of the cliffs and on two sides we have a beastly drop. If one's engines fail when getting off, the best thing

one can do is to pray and hope that the bump won't be too big when it comes. I was nearly caught this way to-day." The aerodrome was unsuitable and absolutely dangerous for the training of young pilots, who frequently arrived there and were put immediately on fast war flight machines, never having flown anything more than a box-kite. Referring to another incident, the same officer wrote to his father:—"Yesterday my engine back-fired. Trouble, inlet valve. The same thing happened at Lewes. Carburettor caught fire. Most unpleasant. One gets cold feet. Sooner come down with a bump than be cremated in the air." This all had reference to machines to which he would refer later on, the engines of which were considered by most of the pilots to be unsafe and unsuitable. This officer was lately sent to Hendon to take a war flight machine to France. There was an extract from his letter:—"After spending some days at Hendon trying to get the machine airworthy, in desperation I started off." He wrote later:—"My engine most alarming. Very busy looking for possible landing grounds. Very wet. Seeing hardly anything. Engine started to give up ghost. No pressure in tank. Had to come down. Spent whole afternoon trying to get beastly engine to go. Awful dud." This officer eventually arrived at Folkestone. He reported later:—"Took the air from Folkestone. Still in the 'dud.' At 3.15 circling round for 15 minutes trying to get 2,000 ft. At that pushed off across Channel. Engine developed alarming vibration. Hardly hoped to reach other side. Arrived Calais at 1,500 ft. Struggled up coast to here." Any Service man would know that a machine which was only capable of rising up to 2,000 ft. in 15 minutes was not a very suitable machine in which to start off across the Channel. The alternative was to come down and be accused of being a coward, or push off across the Channel, and chance diving into the Channel, thus causing a loss to this country of another valuable life. This officer also wrote:—"The beastly thing caught fire." From the father of that officer, who was a most respected citizen, he had received the following letter:—"Dear Mr. Pemberton Billing,—In pleading the urgent and vital necessity of furnishing our flying men with the most reliable machines that brains, money, and energy can provide, I consider that you are performing a great national service. My son, who served as an officer in the Air Service from the outbreak of the war until the time of his death, repeatedly told me that, to use his own expression, with the 'dud' machines they were frequently called upon to fly; if they were not killed in action it was only a matter of time before they would meet their death from accident; and this view I have had invariably confirmed by the large number of flying officers with whom I have come into contact. In fact, I know that many pilots consider the risks from having to fly faulty machines greater than those actually incurred in meeting the enemy. It would therefore appear obvious that a superhuman effort should be made to diminish this risk, and surely such an effort should demand universal support."

By way of comment he might inform the House that our machines were dispatched to France in most cases as aeroplanes only. On their arrival the local squadron smiths did their best to convert them into weapons of war. A gun is stuck here and a bomb is hung on there. The performance of the machine loses 10 to 20 per cent. of its efficiency. For example, the official speed of a B.E.C. was something less than 80 miles an hour. That in all conscience was too low when that machine was called upon to fight a Fokker or other German machine with the speed of 110 miles an hour, whereas by the time it had been turned into this travesty of a weapon of war its speed was reduced to about 68 miles an hour.

THE CASUALTIES TO AVIATORS

He held in his hand a list, which he had compiled very rapidly, and which was far from complete, of over 150 deaths, over 160 wounded, and over 105 men who were numbered among the missing. In regard to the men who had died they could in most recent cases be referred to as "Fokker fodder." In almost every case they had been shot down on the hopelessly outclassed machines by the immensely superior machines which the Germans brought against them.

Not 20 miles from there there existed the finest machine the world had ever seen, far finer than the Fokker machine, finer than anything the Germans had produced, and yet we were content to order this aeronautical rubbish in thousands. We were prepared to order machines from the Royal Aircraft Factory with engines untrue and untested and order pilots into the air to meet their death. Those men who had only been wounded owed their lives to Providence, despite the official negligence and incompetence, but the missing in all cases had been lost to this country on account either of "dud" machines or inefficient engines.

He would deal with a few typical cases from a list he had. He did not wish to shock the House with more cases than were absolutely necessary to prove conclusively his statement of last week. He would deal with one or two cases of men who had been killed in the recent fighting. If the Under-Secretary would like the men's names, the machines they were flying, and the place and date of their death, he would be very pleased to assist him at his convenience. No. 1 is one of the first deaths in the war, though there have been many deaths owing to official negligence before the war. It was a side-slip owing to being sent off in a badly overloaded aerial machine. It was suggested before

leaving that an accident would occur. An accident occurred, and the pilot died. No. 2: B. 28, side-slip; nose dive; bombs blew up everyone on board machine. Similar to that which killed two pilots previously; therefore liable to uncontrollable spirals. No. 3: Passenger was Lieutenant S. B. Same accident, but bombs did not go off. Both killed. No. 6: Victim of engine failure. Lost at sea.

This question of engines was a question of life and death to our pilots, and if the mandarins were allowed to order any engines which they thought fit to order when they were not competent to decide, and if our pilots had to be driven into the air with these engines, their lives were being needlessly endangered.

Another case; shot down by one of our own machine-guns through the obstinacy and stupidity of a brigadier of our own. Two men killed. Shot down near Dixmude. Machine overweighted, and should never have gone over the line. Case 11: Machine caught fire in air with experimental R.F.A. engine. Bombs on board burst, pilot burnt to death in the air. Case 14: Lost at sea flying home on leave with old machine.

It was a very penurious habit in France when there was an old machine which they wanted to get back and which was of no use for any further service, that if a pilot was going home on leave and he liked to go home in it he could do so. It was a dangerous habit to endanger a valuable pilot's life to get an old crock of an aeroplane back to England, and thus save transport.

No. 16: Machine known in the trade to be dangerous, collapsed in the air, killed the pilot. No. 18: When landing, nose dive, engine failure over sea. No. 19: Bombs blew up on landing, killed. No. 20: Side-slip; people without experience should not have been flying alone; killed. No. 24: Spiral dive 300 ft. over the sea; killed. No. 30: Shot down, flying low in bad weather; died of injuries; ordered out on bomb raid in the dark and rain. No. 32: Drowned or killed in a side-slip through overloaded machine. No. 34: Killed in a side-slip under circumstances typical of this type of machine. No. 35: Died of wounds received because of machine being unable to climb after coming down low to drop bombs; engine weakness again. No. 37: Both lost at sea, engine failure presumed. No. 43: Killed; reported death was caused by bombs exploding in the air.

No. 45: Killed, landing in a morning fog after flying all night in a fruitless search for a Zeppelin; the usual official overloaded machine was unable to land slowly and turned over on its side. No. 46: Machine hit by German shell while on water after being brought down by engine failure. No. 47: Fell out of machine in the air; propeller broke.

This was a most regrettable accident. It happened to a young man who had just succeeded in winning the Victoria Cross amid the cheers and admiration of the Empire—a most regrettable and most unnecessary accident. If the First Lord of the Admiralty would like full details he should have them.

No. 48: Brought down by engine failure; killed on landing. No. 49: Engine broke in the air, side-slip and dive. No. 60: Killed in the dark after futile attempt to find Zeppelin; no light for landing.

At present the method employed was to drive men up into the air on machines in which the engine and propeller were in front, and the pilot was unable to see except on his extreme right or left. His face is covered with oil. He was ordered out at night and had been told repeatedly to bring out their machines in a thick land fog. Someone ran up with a few buckets and put petrol in and lighted it, and that was the only light they had got. These men were driven up into the air in machines in which they could neither see nor shoot out of, and the armament in one case was a revolver and in another a Winchester repeater rifle. What justification was there for driving our pilots in the air so armed and so equipped and in such machines that they could not see out of? Simply to answer public clamour or to save the face of official folly.

No. 67: Brought down by engine failure; killed. In this case the machine was totally unsuitable for the type of work. No. 70: Killed in action while testing a type of machine condemned by the French six months ago. No. 71: Killed owing to defective engine. Nose dive. Caught fire. Pilot burnt to death. No. 76: Killed by his own bombs exploding after landing in dark, after searching for Zeppelin. No. 80: Machine caught fire on landing. Pilot died. No. 94: Killed in a side-slip with worn-out machine. No. 99: Killed. Engine failure. Side-slip and dive. No. 104: Two officers, observer and pilot, both killed on photographic duty because they were hopelessly outclassed by the enemy machine. They had no fighting machine with them to protect them on that work.

He asked the House to imagine a pilot in a groggy old machine, tottering in the air over the enemy's lines, knowing he had only about 72 miles an hour in hand, nothing but gadgets all round him which the official experts loved to load on the machines. He had no guns, as the Germans had behind them and in front of them, and he saw an enemy aeroplane which had two guns, one fitted for firing dead ahead through the propeller and one dead astern, and which could fly not 72 miles an hour, but perhaps 110 or 120. He felt this machine circling round him, diving and shooting up and rising above and he was helpless as a duck, absolutely ready to be shot down. When they thought that these men had proved themselves to be not only the most

able but the bravest airmen in the world, when they thought they were driven into the air to be slain like that, it was difficult to find a better word than the one he had chosen.

MISSING OFFICERS

He did not want to exhaust the House, but he had 105 cases of missing officers. All of these men, had we had decently engined machines, would either be in this country now or fighting our battles in the air to-day, instead of which they were suffering an indignity which he understood in some cases was even worse than death to which prisoners of war in Germany were treated. Here was one case. Two of the most able officers in the Service were sent up on a long reconnaissance on an old machine capable of doing 45 miles an hour with a fair wind behind it. One officer said before he left that, although he could get there, he would never get back, and his words proved true. The machine never returned. The cases of wounded were almost too numerous to mention. Here was one in October. A machine was flying for photographic purposes over the enemy's lines and both pilot and passenger were shot. Hon. members had read something of that case. Although the pilot was shot the observer managed to struggle into a position and landed the machine within our lines. For the past two years people who really understood, but cannot obtain a hearing, had been advocating that no machine should fly under any circumstances whatsoever unless it was fitted with dual control. There was absolutely no reason why this should not be the case. It meant that if a machine was flying over enemy country and the pilot was shot, the observer could take charge. Any man who had flown for ten minutes in a dual-controlled machine could bring it back to earth, perhaps with a little bit of a crash, but he could guide it back again. It meant that not only would valuable information be saved and brought to our generals, but that the life perhaps of a pilot and certainly of the observer, and the machine itself might be saved from total loss.

He would like any hon. member to picture himself in a machine absolutely alone walled in by wires, with a pilot somewhere behind. He heard a gasp and a cry and turned round and saw that his pilot was dead. He was sitting there helpless at 11,000 ft., the machine diving and sheering in all directions, and knew that the moment would very soon come when she would get into a nose dive and he would crash 11,000 ft. and be smashed to pieces simply because of the foolish folly of these officials who did not understand and would not be taught that dual control in such a machine would have saved that man's life. I would like to have on the floor of the House one of those men who had been through one of these terrible death dives to tell right hon. gentlemen on the Front Bench what it felt like. No time must be wasted. However important the debates in this House might be, our national existence depended on the issue of this subject. All around London were these accursed old groggy machines, these badly lighted or unlighted aerodromes, and these heroes sitting and waiting to go up to save the face of those who were set in authority over them and who had failed them every time. It was frequently difficult even in law to draw a hard-and-fast line between murder and manslaughter, or, again, between manslaughter and an accident caused by criminal negligence. When this negligence was caused by the official folly of those in high places, coupled with entire ignorance of the technique which, in this case, could alone preserve human life, official folly became criminal negligence, and when the death of a man ensued the line between such official folly and murder was purely a matter for a man's conscience.

Dummy Gun for East Coast Town—Sir W. Gelder (L., Brigg) said they were told before the war that the Zeppelin would never cross the North Sea, and that if it did it would be such a splendid target that it would never get back. At one East Coast town a week or two after an attack by Zeppelins one or two motor anti-aircraft guns were paraded through the streets, and the people naturally imagined they were for the defence of the place and were delighted; but the guns, after being there for a week or two, were taken to another place for a similar purpose. (Laughter.) On one of the large engineering works of an East Coast city there was fixed a solitary gun, and guard was solemnly mounted over it night and day. They all thought it was part of the equipment to protect the city, but they found afterwards that it was only a dummy gun. He did not think it was done for a joke. Was it done in order to convey to the Germans the idea that the place was fortified? He thought it was done to allay the fears and suspicions and anxieties of the people—(hear, hear)—and if that was so such a deception was unworthy of our military authorities. If the East Coast towns were left defenceless and the Germans got to know it, as they would, it meant the blotting out of some of those places.

Sir A. Mond (L., Swansea Town) said that as long as we went on regarding the Aircraft Service as an adjunct to the Navy and the Army, so long we should be in the extraordinary position of having no air strategy. If we could develop a large aircraft fleet it might be a decisive factor in the war. He was not satisfied that everything had been done that could have been done, and he asked what Lord Derby's Committee was doing. Judging from Lord Derby's statements the Committee had no executive power and could not spend a shilling or order a single plane. What was wanted was an executive body.

Mr. Tennant's Reply—Mr. Tennant said Sir A. Mond had

appealed to him to throw off what he seemed to think was a slightly wooden departmental attitude, and to confess that occasionally things went wrong. He was as sadly and melancholily aware as any man could be that mistakes had been made, and he was perfectly free to confess it. The right hon. gentleman had also objected to the War Office acting in a kind of watertight capacity, and having nothing to do with its neighbour the Admiralty. He appealed to hon. members to put themselves in his position of having to defend his Department and having no control over other Departments. It was impossible for him to be so concerned at what might have been the responsibility of some other Department, but which was not his.

For the first nine months of the war the ascendancy of the British air service was remarkable. It was more than anything else a moral ascendancy, and was not, he thought, due to the superiority of our engines. He believed that when the Germans made their effort two or three months ago, we were infinitely better supplied both in numbers and material than previously, and the quality of the officers was the same. On the other hand, the new development came slightly as a surprise, after nine months during which nothing of the kind had happened. The Germans had a certain advantage from the novelty of their new trick. But these tactics were now being met quite satisfactorily. Our reconnaissances, though under difficult conditions, were being carried out with the greatest possible regularity and entirely to the satisfaction of the Commander-in-Chief. Fighting in the air continued with no advantage to the enemy. For the moment the majority of the German aeroplanes were probably faster than the majority of ours, but we could not expect that every one of our aeroplanes should be faster than all the Germans.

We expected to have as good aeroplanes as the Germans, and if possible a larger number of superior aeroplanes. Though at the moment the majority of the German aeroplanes were probably faster than the majority of ours, that state of things was rapidly being altered. There were aeroplanes for different purposes. There were large numbers of reconnaissance aeroplanes, which were armed and usually carried two machine-guns. They were very similar to the German reconnaissance machines. There were also a large number of fighting aeroplanes. Letters from officers at the front calling attention to the superior speed of German aeroplanes came in almost every case from those who were engaged on artillery observation and reconnaissance; other officers told an exactly opposite story. The Derby Committee had been set up, as he understood, as a sub-committee of the War Committee, to advise on various matters of policy in connection with material. He had the greatest belief that it would be instrumental in co-ordinating the duties and needs of the Admiralty and the War Office.

He had not intended to give the impression that the Commander-in-Chief was satisfied with the number of machines and personnel which he had. What he intended to convey was that the Commander-in-Chief was satisfied with the Air Service which he had. That did not mean that he would not like it to be larger. The Government were endeavouring with great energy to do every mortal thing human ingenuity could devise to bring our aircraft and Air Service up to the standard which could be demanded by the public and the commanders in the field. As to the testing of inventions, there were two separate bodies which carried out experiments. One was the Inventions Board of the Ministry of Munitions and the other the Inventions Board which was under the First Lord of the Admiralty. Either of those Boards if they had thought well of the invention referred to by the right hon. gentleman would have had it taken up, put in hand, and experiments made. These Inventions Boards were bombarded by every kind of person, with every kind of folly, and the House would realise that they had to keep a very jealous eye upon the inventions which were submitted to them before they were accepted. As to the little controversy between Mr. Joynson-Hicks and Lieutenant-Commander Dudley Ward, there was no point upon which he did not touch in a previous speech.

Mr. Joynson-Hicks: The right hon. gentleman can leave it alone if he wishes to do so. But the thing is rather awkward, because my hon. and gallant friend made his statement, which I am very loath to contradict.

Mr. Tennant: I shall be very willing to inquire into the facts. Mr. Marshall had made observations about the Isle of Thanet and the desirability of putting signalling stations at various specified points which I am bound to say were very undesirable to bring before the House. Mr. Billing had spoken with some heat, with what he described as emotion. It was always a pity to engender heat in such matters. It was very apt to be subversive of light, therefore he must endeavour to follow Mr. Billing without it. He spoke of ignorance and intrigue among the high officials of the War Office. That was a matter on which he had better means for ascertaining the truth than the hon. member, and he could assure him that he was wholly misinformed. He did not know whether the member for East Herts was alluding to the aerodrome under the Military Wing of the Royal Flying Corps at Dover or not. If he was, all he could say was that it was one of the very best aerodromes they had got.

Mr. Billing: I was referring to the naval aerodrome. Last week I put a question in regard to this aerodrome to the First

Lord of the Admiralty, who answered it, and to-day I put the question to the Under-Secretary for War both as to the military and naval aerodromes.

Mr. Tennant: I am not able to speak for the naval aircraft, but as regards the military aerodrome I am informed that it is one of the best in the possession of His Majesty's Government. He would like to disillusion the hon. gentleman with regard to the factory at Farnborough. It was not a producing factory in the sense of producing large numbers of engines or their parts, but to assist in the manufacture of design.

An Inquiry Promised—In the speech of the hon. member there was a long category of very melancholy casualties. When one was dealing with a very dangerous occupation like flying at a very dangerous time in the middle of a great war accidents must happen. It was impossible to exaggerate the sadness of those things; yet at the same time some of them who had great responsibilities, and who realised the dangers inherent to the kind of warfare and to the conditions of the Flying Corps, had sent their own sons into the Flying Corps, and did not believe they were going to be murdered. His own eldest son was a member of the Flying Corps. So was the son of the Commander of the Flying Corps, Sir David Henderson. As the hon. member had made these statements and had assumed, quite wrongly, that these unfortunate accidents occurred owing to lack of care, owing to faulty mechanism, owing to there being worn-out machines or to the machines being overladen, he would tell him this—that he would make it his business to have these statements investigated by a purely unofficial body—by a judicial body if possible. When the Prime Minister came back he would ask him whether he would not set up a small judicial body to go through the allegations and lists put before the House by the hon. member for East Herts, and to furnish a report so that they might see exactly what had happened. It was not difficult for any hon. member to bring up in a great war lists of casualties and to state facts in relation to individual cases and draw upon the feelings of the House to commiserate with those who had lost their nearest and dearest. But what was on the other side? How many thousands of miles had been flown? How many hundreds and thousands of times had these men gone up and yet nothing had been said about it? They had come back home safe and sound. Anyone who had a friend or relation in the Flying Corps had only to ask him how many times he had crossed the German lines. Many of them had done it hundreds and hundreds of times. Let the hon. gentleman ask any man who knew the facts of the German Flying Corps how many men of their corps had been driven down on their own lines by our pilots. We did not know, they could not tell, because these men had nearly always fallen over the German lines, and British pilots were very modest young men. They did not pretend to have knocked out a German aeroplane unless they were absolutely certain and had seen it hit the ground with a smack. It was believed that a very large number of German aeroplanes had been driven to earth, although they could not say so definitely, because they had not actually seen them.

INSTRUCTIONS TO FLYING OFFICERS

The hon. member had made a very effective point by informing the House that our pilots were ordered out at night, that they were driven up into the air at night, when they could only be driven to their death. He wanted to assure the House that in no case was an officer ordered to ascend at night to intercept a Zeppelin. Full information was given to those officers who were detailed for defence duty, and full discretion was given to them as to whether the conditions were suitable or not. Sometimes it was difficult to restrain young officers. Sometimes they put a liberal interpretation on the term "favourable conditions." But it was believed that instructions were now thoroughly understood, and would be interpreted in the proper spirit. It had never been intended that officers in a training station should endeavour to attack airships at a great height by night, because the machines in which they were being trained were not fitted to undertake such flights, and therefore it had never been considered proper that they should undertake any such task. He wished to make this quite clear, because he understood that there were certain places in England where there had been training squadrons, and where the officers and men had been hooted in the streets for not having attacked the Zeppelins, whereas to attack them with the training aeroplanes which they were using would be useless, absurd, and a waste of human life. Now that he had informed the House that officers were not commanded in any case to go up at night and attack Zeppelins, he hoped the hon. member for East Herts would not consider it desirable to continue in the belief that they were, and that it was not entirely within their own discretion.

Some members thought that the Government had given up the hope of dealing with Zeppelins, but the hope had not been given up. They looked forward to dealing with them more effectively and were doing all they could in regard to material. He did not pretend that all was as they would wish, but things were better than they had been. After undertaking to have further inquiries made about railway lights during raids, he expressed the opinion that there was a great deal to be said for aeroplanes as against Zeppelins. He gladly gave an assurance that airmen were not being sent up in machines that were not fit. No pilots ascended

in machines which, in the opinion of the commanders, were dangerous or unfit for the duty to be performed. This had been the absolute rule of the service at any time during the war. Machines not considered to be really useful were scrapped. Engines were constantly being superseded by better ones, and it was obvious that new engines would not be put in bad or old aeroplanes.

Before concluding, he corrected a false impression produced by the speech in which he spoke of the members of the hierarchy in the air service as having air experience. He had suggested that Sir D. Henderson had spent hundreds of hours in the air, and he was informed that that was an exaggeration, although, of course, Sir D. Henderson had had experience in the air. Referring to Lord Montagu's allegation that the authorities had only one engine for three aeroplanes, he said he was informed that there were more engines than aeroplanes. He hoped the House would recognise that the subject under consideration was engaging the attention of a very large number of really not stupid people and was being pushed on with all the energy at their command.

March 28—*Kent Coast Raid*—Replying to questions by Mr. Brookes and Sir Arthur Markham on the air raid on the Kent coast on March 19, Dr. Macnamara said:—So far as the Royal Naval Air Service is concerned, only one enemy seaplane was brought down. I take this opportunity of referring to the gallant conduct of Flight-Commander Bone, who in a single-seater land machine pursued this enemy seaplane for a distance of 30 miles from the land, where he drove his opponent to the water, killing the observer. He was then compelled, owing to shortage of petrol, to return to land. As to the ultimate fate of the enemy machine, there is in the circumstances no definite information.

The Aircraft Factory—Mr. Bennett-Goldney, having asked the Under-Secretary of State for War if his attention has been drawn to the fact that the high-grade steel used in the German aeroplane engines is more suitable for its purpose than the steel used in the Royal Aircraft Factory for similar purposes; if he is aware that this steel is virtually the same steel as that used by the Germans some years ago; if he can explain why, in the circumstances, this House was informed by the War Office that we were ahead of other nations in aeronautical knowledge; and why we have taken no successful steps to obtain or produce similar steel at our own aircraft factory or elsewhere—

Mr. Tennant has made the following reply:—Only experimental engines are produced at the Royal Aircraft Factory, and

there is no reason to believe that the quality of the steel used there is inferior to the steel used in the German engines. The composition of the German steel is known to us. The Royal Aircraft Factory does not make steel. The steel used in British aeronautical engines is obtained from British manufacturers.

The War Office, in conjunction with the Admiralty, have taken active measures in the matter of investigation of production of steel for aircraft by obtaining a Treasury grant for technical research to be carried out by the Institute of Automobile Engineers and the Society of Motor Manufacturers and Traders, and by assisting in the institution of a committee of aircraft steel manufacturers in Sheffield and a committee of stampers in Birmingham.

March 30—*Hostile Aircraft*—Mr. J. Pease, replying to Mr. Joynson-Hicks (U., Middlesex, Brentford), said arrangements had been made by the Commander-in-Chief, Home Forces, the Home Office, and the Post Office, acting in concert, for the conveyance of warnings of the approach of hostile aircraft to the responsible military and police officers, and to munition factories and other establishments where special action had to be taken in such an event. He understood arrangements had in turn been made by the military and police to advise local authorities wherever it was thought expedient. Telephone exchanges were with few exceptions open always, and telegraph offices were kept open wherever necessary, but it was unnecessary to keep all post offices open.

HOUSE OF LORDS

March 22—*Royal Naval Air Service*—Lord Beresford inquired whether any officers of the Royal Naval Air Service had lost their lives through flying in experimental or faulty machines.

The Duke of Devonshire answered that there was no authentic record of a fatal accident to any officer through the fault of a machine. Last month two officers lost their lives while carrying out an experiment, though every precaution was taken. Experimental work was absolutely necessary, and there was never any difficulty in obtaining volunteers for it.

Lord Beresford explained that the other day he spoke of naval officers having lost their lives through using machines that were not perfect. He had since discovered that the statement was not correct, and he therefore expressed his regret to the House and the Admiralty. Moreover, he was glad to see that the Naval Air Service had made a very satisfactory raid on the Germans.

HONOURS FOR THE ROYAL FLYING CORPS

The *London Gazette* of March 28 contained the following announcement:—

AWARDED THE MILITARY CROSS

Lieut. Cuthbert Roger Rowden, Worcestershire Regt. and R.F.C. For gallantry and distinguished service in the field, in connection with the engagement at Sollum, Egypt: March 14 to 17, 1916.

DISTINGUISHED SERVICE ORDER

Second Lieut. (Temporary Lieut.) Malcolm Henderson, 4th (Ross Highland) Seaforth Highlanders, T.F., and R.F.C.

For conspicuous gallantry when, on photographic reconnaissance, his machine was struck by a shell from an enemy anti-aircraft gun. The shell passed through the nacelle of the machine and took off his left leg just below the knee. In spite of this he succeeded in coming down from 7,000 ft., and landing 3,000 yds. behind our line, thus saving his aeroplane and the life of the observer.

THE MILITARY CROSS

Capt. John Edward Tennant, Scots Guards and R.F.C.

For conspicuous gallantry and skill. During the night he bombed the sheds of an enemy aerodrome, descending to 30 ft. to do so. He shut off his engine in order to avoid giving warning, although there was risk of not being able to start it again. His machine was much damaged by the explosion of his own bombs at so low a height. On his return he requested permission to take another machine and repeat the operation.

Lieut. (Temporary Capt.) Ernest Leslie Gossage, R.F.A. and R.F.C.

For consistent good and zealous work under bad weather conditions, both on patrol and when co-operating with the artillery in operations resulting in the capture of the enemy's position.

Lieut. (Temporary Major) Reginald Percy Mills, Royal Fusiliers and R.F.C.

For conspicuous ability when co-operating with the artillery in operations resulting in the capture of the enemy's position.

Second Lieut. Charles David Danoy, R.E., T.F., and R.F.C.

For excellent work, under bad weather conditions, when taking photographs both before and during operations.

Temporary Second Lieut. Thomas Sydney Howe, 6th Connaught Rangers and R.F.C.

For conspicuous gallantry and skill when on patrol. Second Lieut. Howe and Second Lieut. Leggatt attacked a hostile

machine and drove it down. They then climbed again and attacked another. Under heavy fire from this machine, by a combination of good flying and shooting, they hit the enemy pilot and damaged his engine, forcing him to descend within our lines. The enemy were made prisoners.

Second Lieut. Frank Neville Hudson, Buffs (East Kent Regt.) and R.F.C.

For conspicuous gallantry and skill on several occasions, notably when, although severely wounded in the head, he successfully completed his aerial reconnaissance. After recrossing the line and landing at an aerodrome he at once lost consciousness. This young officer is only 18 years of age, but has many times driven off enemy machines and twice forced them to the ground.

Second Lieut. Edward Wilmer Leggatt, Wilts Regt. and R.F.C.

For conspicuous gallantry and skill when on patrol. Second Lieuts. Leggatt and Howe attacked a hostile machine and drove it down. They then climbed again and attacked another. Under heavy fire from this machine, by a combination of good flying and shooting, they hit the enemy pilot and damaged his engine, forcing him to descend within our lines. The enemy were made prisoners.

Second Lieut. Henry Irving Frederick Yates, No. 14 Squadron, 5th Wing, R.F.C. (S.R.).

For conspicuous gallantry and skill. He was instructed to destroy an enemy waterworks, but, on arrival, found the place defended by anti-aircraft guns and infantry lying on their backs, who opened a heavy fire. Notwithstanding this he pluckily descended to 600 ft., and dropped a bomb into the centre of the waterworks. He thus succeeded in destroying them, and then attacked a machine-gun detachment and drove it from its position by fire from his own machine-gun. On a previous occasion his name was brought to notice for gallant and skilful work on a reconnaissance.

DISTINGUISHED CONDUCT MEDAL

Dalziel, 2250 Second Class Air Mech. A., R.F.C.

Gregg, 4534 Corp. (Acting Serg.) W. W., R.F.C.

Lowe, 10464 First Class Air Mech. (Acting Corp.) H. P., R.F.C.

Corp. (Acting Serg.) Gregg and Acting Corp. Lowe, seeing an aeroplane, which had caught fire with its bombs, blazing on the ground, rushed up and cut out the officer pilot, who was unconscious. Immediately afterwards the bombs exploded. The third award is to Second Class Air Mech. Dalziel, who, when his dug-out was blown in, moved his wireless station to a fresh position in the open, and on another occasion, when his aerial was cut by a shell, repaired it under fire.

CASUALTIES

ROYAL FLYING CORPS

UNOFFICIALLY REPORTED KILLED

Glen, Second Lieut. D. A., R.F.C.

Second Lieut. D. A. Glen, of the R.F.C., who was reported missing on December 29, is now reported killed. He was the only son of the Rev. J. P. and Mrs. Glen, of Norwich, and was 19 years of age. At the beginning of the war he joined the Public Schools Battalion. He was commissioned to the King's Own Scottish Borderers. Before taking up his commission he entered Sandhurst, where he became sergeant of his company. At Sandhurst he was selected for the Flying Corps. In four days he got his pilot's certificate and his wings on July 24. He was at the front for over five months and saw much service. He was recommended for decoration and promotion to flight commander, and was mentioned in despatches on January 1. His 15th and last fight was on December 29 with six Fokkers while acting as escort to another machine.

MISSING

March 18

Shaw, 4995 First Air Mech. P., R.F.C.

PREVIOUSLY OFFICIALLY REPORTED MISSING, NOW UNOFFICIALLY REPORTED PRISONER

Chilton, 876 Second Class Air Mech. J., R.F.C.

Undated

WOUNDED

Fuller, Lieut. C. D., R.F.C.

MISSING

Lerwill, Second Lieut. O., R.F.C.

PREVIOUSLY OFFICIALLY REPORTED MISSING, NOW UNOFFICIALLY REPORTED WOUNDED AND A PRISONER

Palmer, Second Lieut. C. W., R.F.C.

DIED

Palmer, 13638 Second Air Mech. A. E. J.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONERS OF WAR

Newbold, Second Lieut. L. A., Essex Regt. and R.F.C.
Holden, 2259 First Class Air Mech. W.

KILLED

Parkes, 2182 First Air Mech. T. F.

AIRCRAFT IN ACTION

OFFICIAL INFORMATION

ENGLAND

March 27—The Attack on Schleswig—The Secretary of the Admiralty announces that the following four officers and a chief petty officer of the Royal Naval Air Service are reported to be missing after the attack of March 25 by British seaplanes upon the German airship sheds in Schleswig-Holstein:

Flight Lieutenant George H. Reid, R.N.

Flight Sub-Lieutenant John F. Hay, R.N.

Flight Sub-Lieutenant Cyril G. Knight, R.N.

Midshipman Stanley E. Hoblyn, R.N.R.

Richard Mullins, C.P.O. Mechanic, 3rd Cl., O.N.F. 1343.

It should be noted that the number reported missing tallies with the German official statement which was published in the Press on March 27 that four English officers and one non-commissioned officer had been taken prisoners.

March 28—The Schleswig Raid—All ships employed in the operations on the German coast have now returned to their ports, except H.M.S. Medusa, which ship, as was feared, sank, after all her crew had been taken off her in very bad weather. Our destroyers, while dealing with the enemy patrol vessels, were themselves attacked by enemy aircraft, but received no damage of any kind.

(See German Official)

March 30—British Aeroplane Missing—One of our aeroplanes sent out yesterday (March 29) is missing.

March 31—Three Machines Missing—Yesterday (March 30) there was much aerial activity on both sides. A great deal of successful work was carried out by our airmen. Three of our machines are missing.

(See German Official)

April 1—Aerial Activity—Yesterday (March 31) there was considerable aerial activity on both sides.

April 2—Two Hostile Machines Driven Down—Two hostile aeroplanes were driven down behind the German lines. One of our machines sent out yesterday (April 1) is missing.

FRANCE

March 30—Eight Enemy Machines Brought Down—West of Nouvion an enemy aeroplane was brought down by our special guns. The machine fell five yards in front of our trenches. Its passengers were killed. We brought into our lines one of the machine-guns of the aeroplane. In Champagne our special guns brought down a German aeroplane, which fell in the enemy lines near Ste. Marie-à-Py. In the course of the day our aviators displayed great activity. In Champagne, in the region of Dontrien, one of our pilots brought down a Fokker, which fell in flames in the enemy lines. In the region of Verdun five enemy aeroplanes were brought down in the immediate proximity of the lines. Our aeroplanes were struck many times, but all our pilots returned unharmed.

March 30—Bombs on Metz—There is no important event to report on the rest of the front. During yesterday (March 29) one of our aeroplane squadrons dropped fifteen bombs of large calibre on the railway station of Metz-Sablon and five on that of Pagny-sur-Moselle. Last night two of our aeroplanes bombarded the station of Maizières-Metz.

(See German Official)

March 31—Two Enemy Machines Brought Down—A German aeroplane was brought down by our special guns. The machine fell in flames in the enemy lines to the north of Tahure (in Champagne). One of our pilots, in the course of a lively aerial fight brought down an Aviatik, which fell in our lines at Soppe (region of Belfort).

RUSSIA

March 27—Increased Aerial Activity—The flights of German aviators along the whole Dvinsk front are growing more frequent, and at Dvinsk they dropped twenty bombs. The enemy dropped bombs on the station of Stolbtzi and at Raibanovo, south-west of Minsk.

March 29—Bombs on Railway Stations—Enemy aviators dropped bombs in the vicinity of the railway stations at Politzy and Luninets.

(See German Official)

March 30—Enemy Machine Brought Down—Our rifle fire brought down an enemy aeroplane in the Trembovla district (south of Tarnopol). The two aviators, a captain and a lieutenant, were made prisoners.

April 1—German Machine Brought Down—One of our batteries brought down a German aeroplane which was flying over our positions south of Lievenhof. The machine was only slightly damaged. The aviators were taken prisoners.

ITALY

March 27—Austrian Aeroplanes Brought Down—This morning (March 27) a group of hostile aviators flew over the plain between the Isonzo and the Piave with the object of damaging our communications in the rear and the bridges over the rivers. The attack failed completely. The accurate salvoes of our guns brought down one machine near Ajuello and a seaplane in the Grado lagoon, while a third machine was brought down by rifle fire near the Priulo bridge, on the Piave. Of the six enemy aviators, a major, chief of the squadron, was killed and the remaining five were taken prisoners.

March 30—Abortive Austrian Air Raid—An official announcement issued to-day says: "From statements made by the Austrian aviators who had been taken prisoners the last air raid on Italian territory was intended to be a strategic operation of first importance. It failed completely. The objectives of the raid were our communications in the rear, and particularly the railway bridges and road across the Adige, Piave, Livenga, and Tagliamento, on the routes leading to the frontier. Moreover, it was planned to bombard some of our most exposed towns."

"The squadron from Gardola (six aeroplanes), which was ordered to bombard the bridges on the Adige, turned aside to attack Verona, but the fire of our batteries kept the raiders at such a distance that only five people were injured and a few buildings damaged. The enemy aircraft withdrew hastily towards the north, abandoning the task assigned to them. The Pergine squadron (six machines) flew towards the bridges over the Piave and Meduna, and succeeded in dropping fifty bombs on the Priula bridge (Piave), in addition to four on Pordenone, but being made the target of our accurate machine-gun fire missed the objects aimed at, and only caused insignificant damage to a row of houses. Still poorer result was achieved by the Aisovizza squadron (five aeroplanes), directed against the bridges over the Tagliamento. One machine was brought down by our fire, and the others only succeeded in dropping two bombs near the Delizia bridge, without causing any damage. Finally, the Pola squadron (twelve hydroplanes), directed against the railway bridges along the Mestre Portogruar line, was prevented from reaching its objective by the effective fire of our anti-aircraft guns."

March 31—Enemy Aircraft over the Isonzo—Enemy aircraft flew over the Isonzo region yesterday, but were kept at a great altitude by our anti-aircraft artillery. Repeated attempts to raid our positions in the Udine were quickly prevented by the intervention of our pursuing air squadrons.

GERMANY

March 26—English Air Raid—German Admiralty statements "In the morning of March 25 British naval forces assisted in an aerial attack on the northern part of the North Frisian coast. The air attack completely failed, as already reported in the Army communiqué of to-day. Our seaplanes attacked the British naval forces and obtained a number of hits. One destroyer was badly damaged."

March 26—Raid on Salonika—In response to the enemy's aerial attack upon our positions near Lake Doiran we conducted on Monday (March 27) a similar raid upon Salonika. Our flying squadron dropped numerous bombs upon the new harbour, the petroleum depot, and the Entente encampment north of the town.

March 27—Bombardment of Dvinsk—Our aviators bombarded the railway station of Dvinsk, the railway buildings at Vileika, and the Baranovitchi-Minsk line.

(Sec French Official)

March 29—Successful Attack on Railway—A German aerial squadron dropped bombs with good results on enemy railway depôts, especially on the railway station in the western part of Molodetchno (a junction on the Vilna-Minsk line).

(See Russian Official)

March 30—British Biplane Brought Down—In an aerial fight which took place east of Bapaume Lieutenant Immelmann put his twelfth enemy aeroplane out of action, this being an English biplane. Its occupants are prisoners in our hands. The bombs dropped on Metz by the enemy caused the death of one soldier. Others were injured.

(See French Official)

March 31—Three English Machines Lost—In the aerial fight in the region of Arras-Bapaume the English lost three biplanes. Two of their occupants are dead. Lieutenant Immelmann has thus accounted for his thirteenth enemy aeroplane.

(See English Official)

April 1—Four French Machines Shot Down—Our battle aeroplanes have shot down four French aeroplanes—one each near Laon and Mogeveille (in the Woevre), which fell within our lines, and also one each near Ville-au-Bois and south of Haucourt, which came to earth direct behind the enemy line. Bombs were freely dropped on the French flying ground at Rosnay (west of Reims).

April 2—Great Aerial Activity—Great activity has been displayed by the aviators of both sides and numerous aerial battles terminated in our favour. In addition to the enemy aeroplanes brought down beyond our lines, an English biplane was shot down near Hollebeke and the occupants were taken prisoners. Ober-lieutenant Berthold has by this success put out of action his fourth enemy aeroplane. Further, south-west of Lens, an enemy aeroplane was brought down in flames by a direct hit from our anti-aircraft guns. Bombs were freely dropped upon Dombale-en-Argonne (west of Verdun), which is strongly garrisoned with troops, and the aerodrome of Belfort.

PATENT INFORMATION

This list is specially compiled for AERONAUTICS by Messrs. Rayner and Co., Registered Patent Agents, of 5, Chancery Lane, London, from whom all information relating to patents, designs, trade marks, etc., can be obtained gratuitously.

LATEST PATENT APPLICATIONS

- 3,751 A. Anastasi. Dirigible. 13/3/16.
3,759 N. Chenky. Means for destroying aircraft. 14/3/16.
3,964 L. Coatalen. Internal combustion engines for aeroplanes. 17/3/16.
3,842 J. R. Porter. Aeronautical machine. 15/3/16.

SPECIFICATIONS ACCEPTED

- 2,046 Greenwood. Flying machines.
10,887 Ringstrom. Aeroplanes.

SPECIFICATIONS PUBLISHED THIS WEEK

- 15,328 Danielsson. Projectile discharger for aerial machines.
3,092 Langstaff. Flying machines.
3,693 Vasserot. Sighting apparatus for adjusting angles of aim on aeroplanes and automatically correcting errors of verticality.

LATEST PUBLISHED ABSTRACT

- 22,600 "Ammunition." F. M. Hale, Furzedene, Kinnaird Avenue, Bromley, Kent. Consists in attaching to the nose of a shell, 2, intended to be dropped from an aircraft, a rod, 3, which, on impact with the ground, supports the shell a certain distance above ground, while it is exploded by the internal moveable pellet of an ordinary percussion fuse, thus ensuring an unobstructed spreading of the fragments of the shell over the troops. The rod, 3, has at its forward end a disc, 1, of about the same diameter as the shell, 2, and is screwed to the shell, so that it can be quickly removed when the shell is intended to be used for structural demolition.

Printed copies of the published specifications and abstract can be obtained from Messrs. Rayner and Co., at the price of 1s. each.

PAYMENT FOR DANGER

An Order in Council published in the *London Gazette* authorises the payment of a special allowance to officers and men of the Royal Naval Air Service and officers and men, whether belonging to the R.N.A.S. or not, who are employed on acceptance duties and are required to carry out trials on new and repaired machines. This additional remuneration is in consideration of the risks involved, and it is fixed as follows: Commissioned officers, 5s. a day; warrant officers, 3s. a day; men, 2s. a day. Where, however, officers, warrant officers, and men belonging to the Royal Naval Air Service are entitled to higher rates of flying pay they are to continue to receive these rates in lieu of the allowances.



PROGRESS AT THE FLYING SCHOOLS

The London and Provincial School—Report for week ending March 27. Instructors: W. T. Warren, M. G. Smiles, H. Sykes, and W. T. Warren, jun. Pupils doing rolling—Jennings, Garnett, Quayle, and Ferris. Pupils doing straights—Archer, Creaghan, Houba, Rimer, Verbessem, de Goussencourt, Moore, Dawson, Aldous, and Starey. Pupils doing circuits and half-circuits—Vilain XIII. and Brown. Certificate taken this week by A. Brown.

The London and Provincial School—April 1, 1916—Instructors: W. T. Warren, M. G. Smiles, H. Sykes, G. V. Aimer, and W. T. Warren, jun. Pupils doing rolling—Crawford, Svendsen, Jennings, and Ferris. Pupils doing straights—Archer, Houba, Moore, Creaghan, and de Goussencourt. Pupils doing circuits and eights—Vilain XIII., Verbessem, and Starey. Royal Aero Club certificate was taken this week by S. H. Starey, who took an extremely good "ticket," his landings being particularly well-judged.

The Hall Flying School—The following pupils were out during the past week:—With A. Chave—Longton, Smith, Cosgrave, Neal, Chapman, Mahoney, Halliday, Rochford, Roberts. With Cecil M. Hill—Clegg, Osmond, Taylor, Le Grice, Gudger, Rayne, Hucklesby, Robinson, Duncan, Collier, Dickson, Pennell. With H. F. Stevens—L. W. Ormerod, W. H. Longton. Two excellent certificates were taken by Messrs. L. W. Ormerod and W. H. Longton. N.B.—W. H. Longton took only seven weeks to qualify at the Hall School, this being the same period taken by Lieut. Brandon (the Zeppelin straffer) to learn to fly at the Hall School.

BEARDMORE WORLD'S RECORDS

A printer's error in the advertisement of Messrs. Beardmore in our last issue attributed to that excellent engine, among various world's records, one for "Tune." Needless to say, this should have read "Time."

THE HENDON AERODROME

The mess rooms erected by the Grahame-White Aviation Co., Ltd., for their workpeople, equipped with all modern catering and other conveniences, were thrown open recently.

The mess rooms will be under the exclusive management of the Y.M.C.A., who have also expended a considerable sum of money on the provision of a large recreation room for the use of the munition workers. That the arrangements made are appreciated by the staff is evident from the fact that the rooms are crowded daily for breakfast, dinner, and tea.

On the opening day addresses were delivered to the workers by Mrs. Winston Churchill, the Hon. Mrs. Henley, and Mr. Yapp, on behalf of the Y.M.C.A., and by Mr. Grahame-White and Mr. Payne on behalf of the Grahame-White Aviation Co., Ltd. The proceedings were most enthusiastic, and cheers were heartily given for Mrs. Winston Churchill and her large and willing band of voluntary helpers.

With a view to assuring visitors to the London Aerodrome the greatest possible degree of comfort, the Grahame-White Aviation Co., Ltd., have themselves undertaken the management of the cafés in the enclosures. The Paddock café and bar were reopened this week, after having been reconstructed and entirely redecorated on artistic and practical lines. Luncheons are served daily, and afternoon teas are a carefully-studied feature of the catering.

IMPERIAL AIRCRAFT FLOTILLA—SEVEN GOLD COAST AEROPLANES

The Secretary of State for the Colonies announces that £1,500 has been subscribed by the Chiefs and people of Eastern Krobo, Gold Coast, and a further sum of £1,500 by the Head Chief, Chiefs, and people of the New Juaben Settlement, Gold Coast, for the purchase of two aeroplanes for presentation to the Royal Flying Corps through the Overseas Aircraft Fund. This is the seventh aeroplane to be presented by the people of the Gold Coast and its dependencies.

R.A.C. ANNUAL GENERAL MEETING

At the annual general meeting of the Royal Aero Club, held at 166, Piccadilly, on March 28, Professor Huntington, who presided, said that only one "record" had been accomplished during the past twelve months. Mr. H. G. Hawker made an ascent to 18,393 ft. on a Sopwith biplane at Hendon on June 6, which was a British "record." Fifty-five members of the club had died on active service; six had gained the Victoria Cross; thirty-eight had been appointed to the Distinguished Service Order; eight had been awarded the Distinguished Service Cross, and forty-eight the Military Cross. It was stated that proposals for increasing the accommodation of the present premises of the club were under consideration.

SUNBEAM DIVIDEND

The Sunbeam Motor-Car Co., Ltd., of Wolverhampton, has declared an interim dividend of 5 per cent., free of income tax, for the half year ending February 29, 1916.

COMPANY NEWS

BLERIOT MFG. AIRCRAFT CO., LTD., 40, OLD BOND STREET, W.—Meeting of creditors, April 7, Holborn Restaurant, High Holborn, W.C.

AERONAUTICS

A WEEKLY JOURNAL DEVOTED TO THE TECHNIQUE OF AERONAUTICS

(FOUNDED 1907)

Edited by JOHN H. LEDEBOER, B.A., A.F.Ae.S.

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ONE PENNY

ALLIED AND GERMAN AIRCRAFT LOSSES

WITH the losses in airships inflicted upon the enemy by the Allies since the outbreak of war we were at pains to deal at length in a previous issue. To the total then published we now have to add a bag of two further Zeppelins—the LZ 77 shot down by the French at Révigny and the L 15 brought down off the mouth of the Thames. But with regard to aeroplanes the true facts of the case—though fully as important—are infinitely more difficult to establish. As our sole line of guidance in these matters, we are compelled to rely on the official reports issued on both sides, and these reports on close examination reveal such gross inconsistencies as to deprive them of any final value and to cause them to be regarded with grave suspicion in many cases. Needless to say, it is part of the settled policy of any belligerent to minimise his own losses and to exaggerate those of the enemy, and from a military point of view this policy is no doubt generally justifiable.

Now, it is clearly highly desirable that our comparative losses of aeroplanes and those of the enemy should be carefully estimated at this juncture, when this matter bids fair to become a subject for acute political controversy. Unfortunately, our own official reports are by no means so clear when dealing with this subject as might be desired, though, in justification of the authorities that be, it may well be pointed out that owing to the very nature of the case much uncertainty is inevitable. A pilot or observer, after engaging a hostile machine and seeing it dive into its own lines, cannot be certain that his opponent has been mortally struck or the hostile machine has been destroyed. For all he knows to the contrary, the enemy may have exhausted his ammunition or voluntarily elected to give up the struggle and nose-dived for safety into his own quarters, but this does not imply that he has definitely been put out of action. Again, a machine ere now has caught fire in the air and has yet been piloted back to safety. There exists therefore only one reliable criterion in this matter of aeroplane losses, and that is the number of machines brought to earth behind our own lines. When a hostile machine has been driven down into his own lines there may, it is true, be strong presumptive evidence that he has been destroyed; even so the element of absolute certainty is lacking.

And in this respect it may be well to point to one extremely welcome innovation introduced into the official reports issued from the British headquarters, who, since the accession to supreme power of Sir Douglas Haig, have at last made up their minds to take the public into their confidence, and now make it a regular practice to announce from day to day how many of our aeroplanes have failed to return from reconnaissance. Sad reading though these announcements may be for us, they do at all events enable us to check the Hun's unpleasantly vainglorious statements, though these latter for all their bombast are by no means so inaccurate in point of fact as is usually believed.

Accordingly, in pursuance of the object stated, that of arriving at an estimate of respective aeroplane losses on the Western front—an estimate which cannot for the reasons already given be considered as final or even as accurate, but has the merit of providing a comparative standard—we have been at some pains to examine and analyse the official reports issued on both sides for the first three months of the present year. To render the resulting figures as valuable as possible, the losses in aircraft have in each case been grouped under three separate headings: (1) hostile machines brought down behind our own lines, whose fate is consequently not open to doubt; (2) hostile machines brought down in the enemy lines; and (3) machines believed to have been destroyed, but whose fate is uncertain. In this connection it should be pointed out that the reports of our aviators in all cases err, if anything, on the side of caution, and that when they report a Hun as having been destroyed there is very solid ground for our putting implicit faith in the accuracy of their testimony.

The collected figures—full detailed lists appear elsewhere in this issue—are decidedly interesting. During the months of January, February, and March of this year we downed, according to official published information, no less than 29 Huns, while the French accounted for 43 Boche aeroplanes. The following table shows these losses in detail:

	Certainly destroyed or captured	Driven down behind Hun lines	Fate uncertain
Downed by British ...	9	10	10
Downed by French ...	21	13	9
	—	—	—
Total ...	30	23	19

This gives a grand total of 72 Huns out of action as the direct result of the Allies' efforts, though for our immediate purpose it is immaterial whether the machines in question were shot down by our machines, brought down by our anti-aircraft fire, or compelled to alight for some other reason behind the Allies' lines.

Now taking the German official claims. If we are to accept these as trustworthy—and they are not very wide of the mark—the Huns brought down in the same three months 32 English machines (including 3 during the Schleswig raid), of which 29 were totally lost to us by destruction or capture. During the same period, according to the same source, the French lost 30 machines, of which 19 were totally lost. It should be added that neither the British nor the French reports bear out these German claims.

On the other hand, when we come to consider the month of March alone, we are on less debatable ground, for both the French and the Germans have published official reports

of aerial losses and successes incurred during this period, which has been one of aerial activity unparalleled since the outbreak of the war. Thus, analysis of the daily *communiqués* reveals the fact that during March the Germans claim to have destroyed 16 British and 9 French aeroplanes, a total of 25 machines lost to the Allies; this figure tallies with the German summary issued last week; though in addition 14 other French machines are claimed as having been put out of action. To the Hun claim the French officially retort by giving as the number of their own losses thirteen machines, whereof twelve were brought down behind the German lines. It will be seen that there is nothing wildly inconsistent in these two statements. But it is when we come to examine the German admission of Huns lost to the Fatherland that we are forced to the conclusion that they have taken to lying on a grand scale, and most clumsily at that. They own up to the loss of 14 machines. To this the French reply that their aviators brought down nine Huns behind the French lines and 22

of the same kidney behind the German line, while four more Huns were brought down by anti-aircraft artillery. Now it is evident that both these statements cannot be correct; even allowing for a certain amount of justifiable optimism in those cases where the issue is open to doubt, it still remains obvious that the Hun, so far from having his own way in the air, has latterly been pretty badly mauled up aloft.

Finally comes a most interesting statement in a usually very well-informed Italian contemporary, which claims to have established beyond doubt that since the beginning of the war Germany has lost 368 aeroplanes, apart altogether from dirigibles; while Austria mourns the loss of 184 machines. Figures such as these, which we are inclined to accept as being well within the mark, may well make our aerial critics pause in their animadversions. In the words of a prominent member of the Air Service at the Front, "Methinks you people at home protest too much."

"Pricking a Bubble"

It is a very ancient axiom in this country, well understood by those who have taken the trouble to acquaint themselves even superficially with the political history of Great Britain, and even of Ireland, that the moment a man enters public life he becomes a fit and proper person for legitimate criticism—that is, in so far as his public actions and opinions are concerned. It is an axiom equally old, though unhappily not so frequently observed by controversialists who rush into print at the slightest excuse, that such criticism should be confined to the public part of a man's life, and should not descend to the level of personal abuse. We have lately witnessed two excellent cases in support of this recognised truth. The administration of Lord Fisher and that of Mr. Winston Churchill, being matters of public interest, have come in for considerable and acute criticism in certain organs of the Press, and if the controversy has occasionally tended to become unduly acrimonious, at any rate it has been conducted in accordance with the traditions of decent journalism. Unfortunately, such is not always the case, and there exists here and there a type of mind which when its opinions are assailed and it is in a quandary for an adequate reply will loftily close the controversy with a remark to the effect that, anyhow, your female cousins have got thick ankles or that your maternal uncle is fond of tripe and onions. This form of reply is highly effective, for the simple reason that it is probably unanswerable unless you descend to the same level and inform your interlocutor that he is wearing a dirty shirt. Unfortunately, these methods bring us little further, since statements of this order—however interesting they may be, however profound the truth they express—are scarcely germane to the original point under discussion.

These reflections have been induced by the signal honour which a writer signing himself C. G. G. has conferred upon me in a contemporary in deigning to notice an article of mine, entitled "Pricking a Bubble," which appeared in our issue of March 29. That article was written with the sole view of examining the claims of Mr. N. P. Billing, member for East Herts, to be regarded as an expert in matters of aerial defence, or the organisation and administration of our air services, and as the champion of the aircraft industry. In no sense could any one perusing that article in a calm frame of mind and in a judicial temper consider it as a personal attack on Mr. Billing, still less as an "abusive" one. I was and am concerned with Mr. Billing solely in his public capacity and with his public utterances, and this with the two-fold view of the best interests of the air services and of the aviation industry. I held, and still hold, that the personal attacks made by Mr. Billing on those directly responsible for the administration of the air services are not only prejudicial to the maintenance of discipline and efficient working, but were unjustifiable, and

that their very extravagance defeats the very object they were intended to serve, as, it is to be feared, has been the case with regard to the acrimonious campaign waged for four or five years past against the Royal Aircraft Factory. Abuses there are many, both in the administration of the air services and in the somewhat arrogant attitude of the R.A.F.; but these are not likely to be eradicated by publicly calling Lieutenant-General Sir David Henderson the *de Rougemont* of the Air Services. That Mr. Billing is actuated with a sincere desire to secure reforms and has recourse to the best methods whereby in his opinion they may be most speedily brought about, I nor any one else can doubt for a moment. But I hold most strongly that his methods are ill-considered and ill-advised, and are likely in the long run to do more harm than good. The needs of the R.N.A.S. are scarce likely to be furthered by the wild statement that the seaplane has proved absolutely useless, or the interests of the aircraft industry by stigmatising its products as "Fokker-fodder." Those in the know may be able to read between the lines and suitably discount such utterances, but those in the know form an inconsiderable minority; and the danger is that the public, still profoundly ignorant in these matters, will take such statements at their face value, will deem our air services to be in a hopeless state of chaotic disorganisation, until one day the inevitable reaction sets in with the result that our last state is like to be worse than our first. Meanwhile, with all due deference to Mr. Billing's apologist, I see not the slightest reason for altering my views in the slightest particular.

Dope Poisoning

In connection with the two cases of dope poisoning referred to elsewhere in this issue, Mr. D. C. Hutchinson, of the British Aeroplane Varnish Co., Ltd., points out that "Titanine" dope is entirely free from tetrachlorethane or any derivative of chlorine, and is absolutely harmless to the workers. Unfortunately, it appears to be a fact that the vast majority of manufacturers are only allowed to use dopes on both military and naval machines which contain tetrachlorethane, and this in spite of the fact that many of them would naturally prefer to use a non-poisonous dope.

It is quite obvious from the recurring number of fatalities to dope-workers that ventilation alone is no complete remedy; in fact, there is some reason to believe that more than one death from this source has been due to poisonous dopes contaminating food. In any case, since there are non-poisonous dopes on the market of proved efficiency equal in all respects to those containing poison, it is high time that manufacturers should be allowed a free hand in their choice of dope, provided, of course, that it fulfils all other requirements. Anyhow, manufacturers should not be compelled, against their own wishes and better judgment, to use poisonous materials.

J. H. L.

GERMAN AIRCRAFT LOSSES

THE following list of German aircraft losses during the first three months of 1916 has been compiled entirely from the official reports, and will serve as a useful check on the periodical misstatements of the ingenuous Hun. It will be observed that the nature of the casualty is given in the official wording in each case:—

BROUGHT DOWN BY BRITISH

- Jan. 17—Five enemy machines driven down.
- Jan. 19—Two driven down in German lines.
- Jan. 25—German seaplane forced to the water near Nieuport.
- Jan. 25—Two aeroplanes forced down.
- Feb. 5—Five driven down in German lines. One forced to descend with stopped engine and broken propeller.
- Feb. 8—One driven down crossing our line at 500 ft.
- Feb. 14—Double-engined machine driven down in enemy's lines.
- Feb. 29—Albatros brought down behind our lines south of Merville. One burst in flames and fell behind the German lines nr. La Bassée. Fl. Sub-Lt. Simms shot down hostile aeroplane, which fell in flames in front of the Belgian lines.
- Mar. 2—French report from Dunkirk that a German seaplane was picked up at Middelkerke—one of the observers was drowned and the other made prisoner.
- Mar. 10—Hostile machine brought down nr. Tournai.
- Mar. 12—One driven down nr. Lille. One shot down in our lines.
- Mar. 13—German machine forced to descend in our lines.
- Mar. 19—Fl. Comm. Bone brought seaplane down 30 miles out to sea—observer killed.
- Mar. 19—One hostile machine brought down in the vicinity of Radinghem. One driven down in damaged condition.

BROUGHT DOWN BY THE FRENCH

- Jan. 11—One Fokker brought down.
- Jan. 11—One Fokker attacked and brought down in the Forest of Houthulst (in Belgium).
- Jan. 20—Enemy machine forced to land nr. Flin—officers captured.
- Feb. 5—Sergt. Pilot Guynemen brought an enemy aeroplane down in flames between Assevillers and Herbécourt.
- Feb. 21—Fokker side-slipped and fell at Tagsdorf, nr. Altkirch. Albatros brought down by artillery fire nr. Epinal. One brought down within our lines nr. Burez, in the Forest of Parroy—pilot and passenger killed. Two forced to land in the region of Vigneulles les Hattonchatel. One brought down nr. Givry-en-Argonne—aviators made prisoners. One dived suddenly into its own lines.
- Feb. 26—Adj. Navarre brought down with machine-gun fire two German aeroplanes in the region of Verdun; the machines fell in our lines—two killed and two taken prisoners.
- Mar. 1—Enemy aeroplane fell in German trenches in flames nr. La Bassée.
- Mar. 2—In Champagne a German aeroplane, cannonaded by our batteries nr. Suippes, fell in flames in the enemy lines.
- Mar. 2—Adj. Navarre brought down an Albatros in our lines nr. Douaumont—occupants taken prisoners.
- Mar. 7—German aeroplane brought down in our lines by special guns. Both aviators taken prisoners.
- Mar. 8—Two, one of which was a Fokker, brought down in Champagne in the German zone.
- Mar. 8—Three brought down in the region of Verdun in the German zone.
- Mar. 12—Sub-Lt. Guynemer brought down German aeroplane, which fell in flames in our lines. One in our lines nr. Dombaske, in the Argonne—passengers killed.
- Mar. 13—One German brought down in our lines in the Verdun region. Two others in the first German lines.

Mar. 14—Three German aeroplanes brought down by our machines in the German lines. One brought down in the region of Cernay.

Mar. 19—One fell in flames in our lines nr. Montzéville. One French and one German machine brought down each other with their machine-gun fire. Two German machines fell in flames in enemy's lines. Adj. Navarre brought down enemy's machine in our lines in the region of Verdun.

Mar. 20—Enemy machine driven down in our lines nr. Verdun.

Mar. 21—German aeroplane brought down, which fell in flames in the region of Douaumont.

Mar. 30—W. of Nouvion enemy machine brought down by gunfire 5 yds. in front of our trenches—passengers killed. In Champagne German machine brought down in enemy's lines by gunfire nr. Ste Marie-a-Py. Fokker brought down in the region of Dontrien, in flames, in the enemy's lines. In the region of Verdun five enemy machines brought down in the immediate proximity of the lines.

Mar. 31—German machine brought down by gunfire fell in flames in the enemy's lines north of Tahure. Aviatik brought down in our lines at Soppe.

GERMAN CLAIMS

BRITISH MACHINES BROUGHT DOWN

- Jan. 6—Two British machines shot down nr. Douai.
- Jan. 11—British biplane shot down in the air nr. Tournai.
- Jan. 13—Lts. Boelke and Immelmann shot down two English aeroplanes, one N.E. of Tourcoing and the other nr. Bapaume. Third shot down nr. Rouzaix. Fourth, anti-aircraft fire nr. Ligny (6 dead).
- Jan. 15—Hostile machine set on fire in British lines by artillery.
- Jan. 18—Two British machines nr. Passchendaele—3 of 4 occupants killed.
- Jan. 20—British machine brought down. Enemy machine forced to land in enemy's lines and destroyed.
- Feb. 3—British battle aeroplane shot down nr. Péronne—occupants killed.
- Feb. 6—Nr. Bapaume an English biplane was compelled to descend—the occupants were taken prisoners.
- Feb. 9—Nr. Bois le Prêtre our infantry shot down an hostile aeroplane, which fell to the ground in flames. The two occupants were killed.
- Feb. 20—E. of Péronne we shot down an English biplane. The occupants were killed.
- Mar. 1—Nr. Ménin we forced a British biplane to descend, and it was captured with its occupants.
- Mar. 3—Lt. Immelmann shot down E. of Douai a British biplane, with two officers, of whom one was killed and the other seriously wounded.
- Mar. 10—Our battle aviators shot down two English aeroplanes; namely, one monoplane nr. Wytschaete and one biplane N.E. of La Bassée. The occupant of the first machine is dead.
- Mar. 14—Lt. Immelmann shot down two British aeroplanes, one E. of Arras and the other W. of Beaumont. The occupants are dead. N. of Cambrai a British biplane was forced to descend—occupants captured.
- Mar. 15—N. of Bapaume Lt. Leffers shot down an English biplane.
- Mar. 26—Not less than 3 of them were brought down by our anti-aircraft section. The occupants were taken prisoners. (This refers to the Schleswig raid.)
- Mar. 26—Nr. St. Quentin an English biplane fell into our hands undamaged.

FRENCH MACHINES BROUGHT DOWN

- Jan. 11—French machine with 3.8 cm. gun and battleplane forced to land—occupants prisoners, nr. Dixmude.
- Jan. 18—French machine shot down nr. Moyenvic—occupants captured.

- Jan. 24—French machine shot down nr. Metz—occupants prisoners.
- Jan. 25—French biplane, nr. St. Benoist, fell into our hands with occupants.
- Jan. 29—Nr. Apremont machine brought down by anti-aircraft—pilot killed, observer injured.
- Feb. 2—French machine caught by anti-aircraft guns S.W. of Chauny—occupants prisoners.
- Feb. 3—French machine nr. Péronne—one killed and one wounded.
- Feb. 4—French biplane, the pilot of which had lost his way, fell undamaged into our hands.
- Feb. 27—A French aeroplane, within reach of Metz fortress, was shot down, occupants captured.
- Mar. 1—Two French biplanes were shot down by rifle fire—one N.W. of Soissons, its occupants being captured; and the second S.W. of Soissons. Its occupants are

- Mar. 20—Lt. von Althaus shot down enemy aeroplane over the enemy's line W. of Lihons. Lt. Boelke shot down his 12th aeroplane over the Forges Wood, on the left bank of the Meuse. Moreover the enemy lost 3 further machines. One nr. Cusey, one fell down in flames nr. Reims; the other turning over in the neighbourhood of Bau de Sapt, close behind the enemy's lines.
- Mar. 22—Three enemy aeroplanes were put out of action N. of Verdun. Two of them came down behind our front N.E. of Samogneux, the third crashed down in flames behind the enemy lines.
- Mar. 26—A French aeroplane fell down in the Caillette Wood and was dashed to pieces.
- Mar. 30—E. of Bapaume Lt. Immelmann put his 12th aeroplane out of action, this being an English biplane. Its occupants are prisoners.
- Mar. 31—In the region of Arras-Bapaume the English lost three biplanes. Two of their occupants are dead.



Photo by]

FOOTBALL TEAM 1915, R.F.C. AT BROOKLANDS

R. N. Stephenson

apparently dead. (French report: Safe return of machine in the latter case.)

- Mar. 9—In the neighbourhood of Verdun it is certain that three enemy aeroplanes have been shot down. The machine of the commander of the squadron was shot down. He was taken prisoner. His observer was dead. (This refers to the French attack on Metz.)
- Mar. 11—French aeroplane fell in a burning condition S.W. of Chateau-Salins, between our lines and those of the enemy. The occupants, who were dead, were secured by us, together with the debris of the machine.
- Mar. 13—Three enemy aeroplanes were destroyed, two in Champagne and one in the Meuse district.
- Mar. 14—Lt. Boelke brought down two enemy aeroplanes behind the French line. Both machines were destroyed by our artillery.
- Mar. 15—Both nr. Vimy and in the neighbourhood of Sivry a French aeroplane was brought down by our anti-aircraft guns. Over Haumont a large French battleplane fell to earth. Its occupants prisoners. The occupants of the other machines mentioned are dead.
- Mar. 16—A French aeroplane was shot down S.E. of Beine. The occupants were incinerated.

COMMANDER BONE'S EXPLOIT

On April 7 the Press Bureau issued the following fuller report of the exploit of Flight-Commander R. J. Bone:—

"Flight-Commander Bone left the aerodrome while the enemy machine was still in sight, and making no attempt to climb his machine steeply, concentrated on keeping the enemy in sight. After pursuing for nearly 30 miles, the superior climb of his machine enabled him to attain a position at 9,000 ft., 2,000 ft. above the enemy. From this position, by flying level, or slightly nose down, he rapidly overhauled the enemy and endeavoured to make a vertical dive on to him, firing his machine-gun. The enemy replied vigorously. Flight-Commander Bone then manoeuvred to get ahead of the hostile machine, and having succeeded, steered straight at him, diving so as to pass below him, and turning with a vertical right-hand bank almost immediately under him. The German pilot turned his machine away a little to the left before they met, and the observer was visible hanging over the right-hand side of the fuselage, apparently dead or severely wounded. The gun was cocked up at 45 degrees to the vertical. Flight-Commander Bone's speed carried him up to within 15 to 20 ft. of the enemy machine, and he had no difficulty in keeping his sights on, firing four or five bursts of about six rounds until the enemy dived steeply with smoke pouring out of his engine. The propeller stopped in a vertical position, but the machine was under control and succeeded in landing safely. The fight was over at 2.50 p.m., and as Flight-Commander Bone was powerless to do anything while the enemy remained on the water, and as his engine showed signs of giving out, he returned to give information. Flight-Commander Bone has distinguished himself on previous occasions in France."

PROGRESS OF AMERICAN AVIATION

By ERNEST L. JONES, American Editor

CIVILIAN NAVAL FLYING CORPS

IN a hearing before the House Committee on Naval Affairs, Admiral Blue gave some interesting opinions and explanations regarding proposed legislation to establish a Naval Flying Corps.

He called attention to the known shortage of officers in the Navy and the desirability of assigning graduates of the Naval Academy to aviation, but offered the opinion that under the circumstances "it is time we consider seriously the question of forming a special corps of aviators from among civilian fliers.

"This Bill has been drafted to carry out that purpose. . . . I think it would be a great deal better if we could restrict the activities of naval aviation to the personnel of the regular Navy without going outside, but under the conditions I have mentioned before I think it is time for us to consider going outside and getting officers and putting them in a special corps for aviation duties, but at the same time this should not prevent naval officers from engaging in flying and going through the school of instruction, as we have them doing to-day. By reading this draft you will note that it allows the nucleus of this corps to be formed from the regular officers who are already skilled fliers, and that it permits the Secretary of the Navy to make a certain

"flight commanders." Five commanders would be handled by a captain or senior flight commander.

The personnel would be administered in the Bureau of Navigation, and the operation of the corps by the Chief of Naval Operations, and the material part of the corps could be administered in the various bureaus which look out for the particular material concerned. Admiral Blue does not think it well to establish any independent head of any corps: "It is all within the Navy now, and can be well administered with the organisation we now have."

Admiral Blue's idea is to take the flight commanders from civil life after the start with officers from the regular service. The question was brought up as to whether officers would enter the flying corps, as in so doing they would cease to become regular line officers, and there is no further promotion provided save as provided in this flying corps. Admiral Blue thought there would be plenty of officers who would take up aviation.

PROGRESS OF THE BURGESS COMPANY

IN view of expanding business and the prospect of a still further increase, it has been found necessary to make extensive alterations and reorganisation of the plant of the Burgess Company at Marblehead. As a result the capacity



TOWING BURGESS-DUNNE WARPLANE AT PENSACOLA

number of acting appointments each year from civil life into the corps, and that after two years these acting appointments may be confirmed. The Secretary of the Navy is also authorised to appoint as many as thirty student fliers and to maintain that number, but they are not to become officers in the corps until they shall have graduated from the flying school. They would go through the regular flying school which we have established, and after two years would be ready to be commissioned as regular officers in the flying corps. . .

"The main point . . . is the fact that if we are to form a special flying corps it would be simpler to get more officers in less time by going into civil life and taking the aviators already skilled in flying. They, of course, would be taught under the regular naval officers, who form the nucleus of the corps, naval discipline, naval methods, and also a certain amount of naval training that would fit them to operate their flying machines in connection with the ships.

"The highest rank that was considered was that of commander, and the pay would be the same, rank for rank and rating for rating, as it is in the Navy for the officers engaged in flying." These commanders would be called

will be raised from one to two or three machines per day. Since 1909, when the first Burgess aeroplane was constructed, in what was then a boat-shed, with the aid of half a dozen men, the concern has grown to a point where it occupies twelve buildings, with a high-water pay-roll exceeding 200.

The alterations in the main shop comprise an entire reconstruction internally, including a cement floor as base for the heavy machinery, the rearrangement of the equipment along lines designed to cut down to the last possible degree waste of time, and the installation of the latest apparatus invented for the use of aeroplane producers.

Another new feature included in the improvement of the plant is the recently constructed hangar for launching machines for flights from the harbour surface. This structure with a width of 60 ft. and a depth of 100 ft., will easily house two machines. Its most notable and interesting contribution, however, to the science of handling aircraft lies in its provision for putting aeroplanes overboard.

This is considerable of a problem at Marblehead owing to the deep water in the harbour and the tide, which ranges from 10 ft. to 13 ft. A marine railway is slow and difficult, demanding, as it does,

the machine be navigated into a narrow slip, the sides of which threaten the safety of the wings, especially when the operation is performed in a strong wind.

The new hangar does away with this trouble by dropping the aeroplanes directly in the water. Suspended lengthwise from a steel framework under the roof of the shed is a track with a roller carriage. This carriage is run to a point over the machine to be launched and a chain hooked to a point directly over the centre of gravity. A geared-down roller carries an endless chain, by which the aeroplane can then be lifted from the floor of the hangar with slight exertion, so little, in fact, that one man, with one hand, can perform the operation.

When clear of the floor, the machine, carriage, and all is run along the track to a point over the water, the track extending out some 15 or 20 feet of the front of the building. Once more the endless chain is brought into play, and the aircraft is launched. The entire operation requires far less time than is required to tell about it. After returning from a flight the aviator can run his machine up under its own power close to the wharf on which the hangar stands, the lifting chain is hooked in, and the aeroplane brought in in no time.

Outside work at the Marblehead plant of the Burgess Company has been badly hampered by the severe weather conditions, which have greatly delayed trials of the Navy



DRIFTING BURGESS-DUNNE WARPLANE
AT PENSACOLA

school machines. The squadron of six has been completed, and shipment to the Navy Aeronautic Training Station at Pensacola only awaits the outcome of the builder's trials.

Despite the gales, heavy snowstorms, and ice conditions in the harbour, Aviator Walter E. Johnson, of the Curtiss Company, has made a number of flights, and reports that the machine, in the air, operates as easily and as satisfactorily as could be desired. As yet, however, it has been impossible to make speed and climbing tests under full load conditions.

The photograph which appears elsewhere in these columns gives an excellent idea of the appearance of the school machine. The overhanging upper surface, with ailerons on the top wing only, and the carefully streamlined fuselage, are noteworthy features. The simplicity of the system for supporting the machine on the pontoons will also be noted.

From Pensacola, Aviator Clifford L. Webster, who has been putting the naval war plane through its tests there, has brought up some interesting views. The flying qualities of this craft have commended themselves very highly to the naval authorities, and it is not impossible that the squadron may see service at points along the Mexican coast, in connection with the blockade which is confidently expected as an accompaniment to the land operations against Villa in the North.

PACKARD COMPANY TO FLY THEIR MOTORS

A LARGE tract of land fronting on Lake St. Clair has been purchased for testing purposes by the Packard Company. The first aircraft, to be used for testing purposes, will soon be delivered. It is a Sloane biplane, tractor type. Probably considerable time will elapse before the company can give the new engine a sufficient test to warrant quantity production.

The new motor will embody the basic principles of the "Twin Six" automobile motor, but will be of larger piston displacement, and every known means will be employed to save weight without sacrificing strength and reliability.

As has been printed in AERONAUTICS, the Packard Motor Car Company is engaged in developing a V-type twelve-cylinder motor for use in aircraft. This engine will develop 200 h.p.

MARK L. BRISTOL

The aviation forces of the Navy have been developed to a state which will permit active co-operation with the fleet in the near future. Capt. Mark L. Bristol, whose experience as Director of Aeronautics in the Navy Department has given him the necessary familiarity with the construction of aircraft and their development to fit him to take control of active operations in the field, has been ordered to proceed to Pensacola, Fla., and assume duty in command of the air service and in command of the *North Carolina* in connection therewith. Capt. Bristol has been directed to assume supervision over all aircraft and aircraft stations, and the further development of aeronautics in the Navy. The departmental end of the development of aeronautics will be incorporated in the material division of the office of the Chief of Naval Operations. The July class of student naval aviators, at the Naval Aviation Station, Pensacola, have completed their theo-



BURGESS NAVAL SCHOOL MACHINE

retical examination for aviator certificates and taken the practical flying tests required. A new Burgess-Dunne aeroplane and a Thomas aeroplane were received and are in process of assembly. During the week ending February 26 there were 20 hours and 20 minutes of flying, an equivalent of 1,180 miles of direct flight being accomplished.

ARMY FLYING NOTES

San Diego, Cal., March 3, 1916—Damage to railways from washouts during the January storms has been repaired and train service between San Diego and Los Angeles was resumed February 18, after a suspension of one month.

February weather was somewhat better than that during January, permitting flying on twenty-one days. During this period 570 flights were made, with a total duration of 257 hours 25 minutes. One hundred and eighty-nine passengers were carried. Lieutenants Robertson, 11th Cavalry, Johnson, 19th Infantry, and Harmon, 27th Infantry, reported during the month and started instruction in flying. Lieutenant Richard B. Barnitz, 14th Cavalry, reported February 28. The following started in flying alone in February: Lieutenants McDonnell, 11th Cavalry, Hefferman, 5th Cavalry, and Butts, 3rd Cavalry, and Captain Duarte, of the Portuguese Army.

RANDOM REMARKS

XLIII.—MY AEROPLANE IN ACTION By ARTHUR LAWRENCE

MY good friend, Sir Joseph Lyons, is now charging ninepence for a brace of poached eggs. In fact, De Rougemont and I would have enjoyed our lunch more if it had cost him less. My fur coat gave the thing tone, and Ruggy—as I shall now call him—settled the bill. It was during our sybaritic repast that I let Ruggy know that the aeroplane on which I had flapped off to Hendon and which had gained me



"IT WAS NO USE GOING INTO THE MARKET FOR MASCULINE LABOUR"

my knighthood was only a trial machine made up to secure the 101 patents which now stand in my name. Having three millionaires well under control, I had no lack of money. It was essential that my second and far larger aeroplane should be promptly completed. It was no use going into the market for masculine labour, but

some eight thousand women and children were working on my Giant Pterodactyl with all the enthusiasm that unlimited cash and ginger wine can afford. I had arranged them into three gangs, so that one gang did not know what the others were doing. No one could possess more than a third of my knowledge. The only men employed by me were professional garotters, who had undertaken to kill anyone of Teutonic appearance found within thirty miles of my works.

There is now no harm in stating that my aeroplane measured one-eighth of a mile from the tip of one wing to the tip of the other. It was driven by eight engines of 8,000 h.p., but, mainly on account of the terrific weight of explosives carried, it only travelled at one hundred and eighty miles an hour. It was natural that the figure eight should recur in this way, because you have to make that figure when stirring the ingredients of an omelette with a fork, as, also, when you are skating on very thin ice. The laws of inverted evolution adumbrated by this necessity is the sort of thing which you may fairly expect to find in any other part of this paper. I have calculated that there are enough recondite matters involved in my Giant aeroplane to keep eight expert contributors fully employed on theorising and making diagrams for the next hundred years, by which time I hope the inventive genius of my countrymen will have made the novelty of my super-plane a thing of the past. The time came when all the hangars, sheds, parts, pressmen, and so forth were cleared away from the Hendon aerodrome. The time had arrived for the parts of my second Pterodactyl to be well and truly assembled, and there was little room for anything else. The women and children had all been paid off, after having festooned my creation with the flowers of the season.

The noise of the engines could be heard from Hendon to Brooklands and from Gravesend to Harrow.

Some millions of starred workers and others, including a few thousand athletic muddlers from the Censor's department, were able to see us start without losing any patriotic funds by way of any charge for admission. Ruggy had provided himself with relays of his see-through-anything glasses, and we were laden from stem to stern with the highest explosives and *crème-de-menthe*. My only fear was that we should be shot at by some of our anti-aircraft men on the English coast. I recalled one really fine gun, in particular, which I knew to be handled by an old man whose vision no glasses will rectify and a young fellow who had lost the use of his arms, but who can now do the most marvellous things with his toes. By this time we had risen to not more than 5,000 feet. We had excellent heating arrangements, but, rather recklessly, as it turned out, I thought we might as well enjoy the warmth of the lower strata of air while we could. There came a dull boom from below. It was such a good shot that it could not have been anything else than a fluke. My observer jumped off his seat. The shrapnel had burst just beneath us and one of the bullets had made Ruggy sit up.

With the aid of my jack-knife I extracted the bullet from my now restive friend. I looked at the bullet.

It was stamped "Made in Germany," although blown off in England. "Dash it!" said Ruggy, "that prevents you from saying that 'we were hoist with our own petard.'"

"Sir," I responded, "I never make use of *cliché* phrases," whereupon there arose a coolness between us, which was due to my making another 5,000 feet upwards in double quick



"GAROTTERS FOR ANYONE OF TEUTONIC APPEARANCE"

time. It was not until we had flown over the English lines, where one of our bombs dropped—in error—although, as I was told afterwards, with no worse result than smashing the penny bottle of ink which was being used by the historian of the *Daily Mail*—that Ruggy began to make use of his all-penetrating Telo-Micro. He turned pale, he trembled and shook. Our enormous planes swayed to the rhythm of the awful language he used. "I never thought of that. I am seeing too far. My sight goes far deeper than Germans. At first I thought the entire German lines were in flames, but I am looking beneath the crust of the earth's surface. If the glasses were much stronger I should be seeing the turtles swimming about in Sydney harbour. I shall have to shorten sight somehow. It never occurred to me that there was the danger of seeing too much."

(This amazing story may be continued next week.)

MODEL AEROPLANES—XXIX

By F. J. CAMM

THE container supplying the pressure to drive the c.a. engine which has been the subject of my last two contributions is constructed from brass or copper foil of .001 or .002 gauge, brass being used for preference. The gauges of all thin foils are expressed in the decimal equivalent of their thickness, and so the container illustrated in Fig. 89 is to be made from foil either one or two thousandths of an inch in thickness. As the weight of the complete container should not exceed four ounces it is essential that either of these gauges only be used. The semi-circular end caps or half-balls are of 30 B.W.G., and should be bought *with* a flange, as this provides a much stronger and neater fixture for the ends of the container body. Each half-ball should have an outside diameter of three inches, so that the capacity of the finished container will be equal to the volume of a sphere of three inches diameter, plus the volume of a cylinder twenty-one inches in length and three inches diameter. Thus:

$$\text{vol. of sphere} = \frac{4}{3} \times \frac{22}{7} \times r^3$$

$$\text{vol. of cyl.} = \frac{22}{7} \times L \times r^2$$

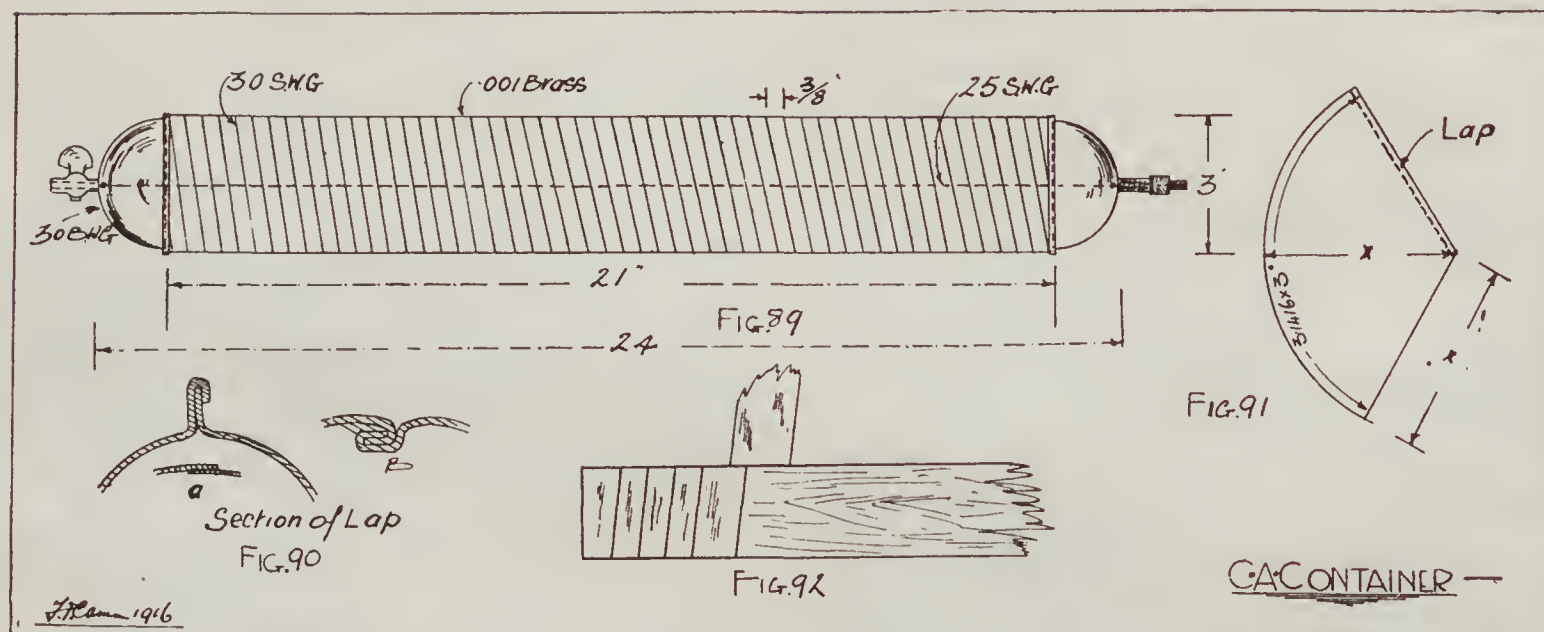
$$\text{vol. of container} = \left(\frac{22}{7} \times L \times r^2 \right) + \left(\frac{4}{3} \times \frac{22}{7} \times r^3 \right) \\ = 62.642 \text{ cubic inches.}$$

ing the comb over the surface towards the edges of it. Now make the fold referred to above, and wrap the foil round the wooden former. Bring the second edge under the first and note whether the foil is loose upon the wooden former—if so, a strip of foil must be cut away so that it is a tight fit round the wood. Complete the bend as at *b*, brush the flux along the groove, and with a medium-heated soldering iron flow the solder along the seam. The edges of the foil should previously have been tinned, so that the solder flows through the whole lap. This constitutes by far the strongest means of fixing the edges—there is little danger of the seam bursting under pressure. A simpler lapped joint is given at *a*. The edges are brought into contact with one another (they should, of course, be first tinned) and sweated together.

The next operation is to wind the body with piano wire, to obviate it bursting when inflated. The pitch or distance between the spirals must be made $\frac{3}{8}$ of an inch. Each spiral should be soldered in two places; for neatness each should be soldered upon the seam, and directly opposite, i.e., on the top of the container.

Now tin the ends of the body and the inside of the half-ball flanges, and solder one half-ball into place. A small hole, say 1/64th of an inch in diameter, is drilled in each half-ball through which to pass a 25 s.w.g. endstay wire.

Withdraw the wooden former, solder one end of the stay



I would here warn my readers against the old practice favoured by many French firms of using *two* containers. The fallacy of so doing lies in the fact that if a *single* container were constructed of *double* the diameter of one of the smaller containers, we obtain *four* times the capacity of this latter for the same weight as two. This by the way.

An airtight tap is soldered into one half-ball and a cycle valve into the other—the valve provides ingress of pressure from the pump to the container, and the tap egress of the pressure to the engine. Spirits of salts should not be used as a flux for the solder owing to the deteriorative effect of this upon thin metal; resin or fluxite must be used. The next portion to take in hand is the body or cylindrical portion of the container; but first a wooden former must be procured to support the foil during the soldering of the lap and the spiral winding with piano wire. The ends of it must make a fairly tight fit into the flanged portions of the half-balls; a length of builder's pole carefully cleaned up to size would do. The size of the sheet of foil will require to be $\frac{22}{7} \times 3$ inches = $9\frac{1}{2}$ inches approximately, or allowing an inch for lapping, $10\frac{1}{2}$ inches. Details of the form of the lap are given in Fig. 90. As there shown, one edge is first folded down to clip the second edge. Before, however, the foil is used all wrinkles should be stroked out with the back of a comb by laying the foil upon a sheet of glass and work-

wire into the hole drilled in the half-ball already fixed, pass the loose end through the hole drilled in the second half-ball and sweat this into place. Now pull the end stay wire taut, and solder, cutting the superfluous end off flush. To put a finish upon the soldering it should be brushed with a solution of sulphate of copper (blue vitriol); this deposits a thin film of copper upon it and imparts quite a commercial "finish." If it is desired to lessen head resistance a little by fitting coned end-caps, these could be made as indicated in Fig. 91. We will assume that we require them to be *X* inches in length. An arc is struck off, of *X* radius, the perimeter of the arc being equivalent to π (3.1416 , or $3 \frac{1}{7}$) \times diameter of container; complete the sector of the circle by connecting up the two points to the origin or centre (allowing $\frac{3}{8}$ of an inch for the seam). By bringing the two edges together the blank assumes the shape of a cone. The apices are cut away to allow the tap or valve to pass through. Sweat the seams together and solder the finished caps to the cylinder, with the seams in alignment with the seam of the cylinder. Fig. 92 illustrates another method of forming the body—strips of foil are wound spirally round the former; a container so built does not require winding with wire, the rather lengthy lap providing ample rigidity. Next week I shall deal with the testing of the container.

(To be continued)

REPLIES TO CORRESPONDENTS

L. C. (Clapton).—The container must have a capacity of about 350 sq. in., and so could be 21 in. in length and $2\frac{1}{4}$ in. in diameter. A single-cylinder oscillating engine will hardly develop sufficient power to fly a machine. We should advise a twin horizontally opposed engine of $\frac{1}{2}$ in. bore and $\frac{5}{8}$ in. stroke, or, if you intend using a single cylinder, $\frac{3}{8}$ in. bore and $\frac{3}{4}$ in. stroke would be about correct; but oscillating engines are as a whole unsatisfactory, due chiefly to excessive friction on the valve faces and wastage of compressed air. Sheet tin is unsuitable; brass or copper foil, .001 of an inch in thickness, should be used and wound at intervals of $\frac{3}{8}$ in. The dimensions of the machine are dependent upon its ultimate weight, and as no particulars are furnished it would be superfluous to hazard a guess. Also, the pitch and diameter of the propeller can only be found by experiment—so much depends upon the engine efficiency. The writer, however, intends going fully into the construc-

tion of compressed air engines and models in the articles now running.

A. E. S. S. (Streatham).—Use hickory, $\frac{3}{8}$ in. \times $3\frac{3}{32}$ in. in section, for the plane framework, spruce $\frac{1}{4}$ in. \times $\frac{1}{8}$ in. for the interstruts, piano wire for the tail planes and rudder, and umbrella ribbing and piano wire for the chassis. It is impossible, or nearly so, to predetermine the diameter and pitch of the propellers for reasons above stated. Our opinion of four-bladed propellers is not such as would lead us to recommend their use. As stated hitherto, I intend going fully into all matters connected with compressed air.

H. R. S. (Birmingham).—We much regret that under existing conditions it is impossible to devote more space to models, much as we would like to do so. Many thanks for appreciative letter. We have already dealt with the construction of several successful models, and others will be dealt with in due course.

G. O. P. (London).—Reply has been sent.

MODEL EDITOR

STATEMENTS IN PARLIAMENT

HOUSE OF COMMONS

March 21—*Dope Poisoning*.—Mr. Rowlands asked the Home Secretary whether his attention had been called to the death at Peterborough of James Steels, employed by Sage, Ltd., from dope poisoning;* whether he was aware that Dr. Alexander Walker, who made the post-mortem examination, stated in his evidence that in his opinion the death of Steels was due to toxæmic poisoning, no doubt due to tetrachlorethane; and if he intends to take immediate steps to secure the use of non-poisonous dope for the highly-poisonous dope now in use.

Replying, Mr. Brace said: I have received reports on this case which confirm the view that death was due to tetrachlorethane poisoning. Inspection showed that the system of ventilation installed for drawing off the fumes was defective in some respects, and instructions have been given for improvements to be made. With regard to the latter part of the question, as I informed my hon. friend in answer to a similar inquiry a fortnight ago, the obstacle to the use of the non-poisonous dope is that one of the essential ingredients is not produced commercially in this country at present, and sufficient quantities of it are not available, but the departments concerned are making every effort to arrange for an increased supply. Meanwhile, new instructions embodying further administrative measures for guarding against the danger have been issued by the Home Office to all aircraft factories, and steps are being taken to extend the use by contractors of a dope made under War Office supervision which contains as little tetrachlorethane as possible.

* This case is fully reported elsewhere in this issue.—ED.

April 4—*Air Defence*.—Mr. Billing (Ind., E. Herts) asked whether in view of public dissatisfaction with the existing methods of air defence as revealed in the last three raids over a wide area of Great Britain the War Office was now prepared to give consideration to the proposals for effective defence submitted to the authorities in the early days of this war by the member for East Herts.

Mr. Tennant (L., Berwickshire): I have had notice also from the hon. member for Brentford of a question asking whether I could state who was responsible for bringing down the Zeppelin. It is not possible to be certain to whom the credit is due for bringing down the Zeppelin, as several hits are believed to have been made, and these by different batteries. The new arrangements for the defence of London and munition factories in and around London have proved very successful. More than one attack has been driven off from the metropolis without the inhabitants becoming aware of it. Replying to Mr. Billing, Mr. Tennant said: I have already promised an inquiry into the hon. member's allegations. That inquiry will be held.

Mr. Billing: That is not an answer to the question. In view of the intensely unsatisfactory answer—(cries of "Order.")

The Speaker: I do not know what steps the hon. member took to inform the Minister that he was going to ask these questions. They were only put into my hands about twenty minutes past three.

Mr. Tennant: The hon. member's question was put into my hands after I arrived in the House.

Mr. Billing gave notice that he would raise the matter on the adjournment.

April 5—*A Fighting Air Machine*.—Answering Mr. Hogge, Mr. Tennant (L., Berwickshire): said: The Mann and Grimmer aeroplane M 2 has been brought to the notice of the War Office. The first machine was to have been tried by the War Office, but was smashed before it could be submitted. Messrs. Mann and Grimmer then applied for financial assistance to build another aeroplane, and designs were asked for in order that the merits of the machine might be considered. These have just been received and are now under consideration. Asked whether he knew that Messrs. Mann and Grimmer's experiment would have

to be abandoned unless financial assistance were given, Mr. Tennant replied that, although he was not aware of this, the point would no doubt be taken into consideration.

Mr. Lynch (Nat., W. Clare) suggested that it was to the public interest to foster such a firm as that mentioned. It had shown genius and technical skill.

Mr. Tennant said that if this were proved no doubt assistance would be given. Being told by Mr. Hogge that £1,000 would enable the firm to complete their experiment, Mr. Tennant said that he was obliged for the information.

Air Defence.—On the motion for the adjournment of the House, Mr. Billing (Ind., E. Herts) raised the question of the defence of the country against raids by aircraft. He said he thought the Under-Secretary for War owed him a debt of gratitude for having thus afforded him the opportunity of making a statement so soon after the recent devastating raids which covered a very considerable area of this island. On very few occasions had the Germans failed to carry out their threats concerning air raids, and the country was right in demanding that it should have some other forms of defence than a few aeroplanes unsuitable for the work to which they were set, darkness, and a request that the citizens would remain quiet and take their punishment. Our defences were not only inadequate, they were not even properly conducted. He had a letter from an officer in charge of an anti-aircraft gun which, had it been used, might have done good service, stationed in a place which might be looked upon as the last line of defence of London. That officer stated that he received no official warning of the raid on April 1; that the local station-master telephoned to him that a Zeppelin was approaching; that later he heard the Zeppelin and afterwards saw it clearly through his glasses when it was hovering within easy range of the gun: that the gun could not pick it up because the searchlight was not showing; and that when he asked the War Office why he had not been warned the officials expressed astonishment. The only official message which the officer received was on the following morning to the effect that the coast was clear—presumably clear for the Zeppelin. This was disgraceful mismanagement. The officer could not engage the Zeppelin; because he had no official instructions he had to wait. He wished to know what discretion was left to such officers. Were they not allowed to fire a gun or raise a hand in defence of the country?

Once a Zeppelin had crossed the coast it was handed over to the military, but there was a moment before it crossed the coast, and then it was for the Admiralty to take charge. On the night of one of the raids a certain commander in the North Sea saw a Zeppelin flying towards the coast. "There was an engagement," wrote this officer, "and he bombed me and put his machine-guns on me and then bombed me again. He ultimately flew away. I almost wept because I had no night sights for my pop-guns." If that officer's craft had been fully equipped he might have accounted for the Zeppelin and thus saved lives and property and the country from a certain amount of indignity.

THE EQUIPMENT OF TRAWLERS

He asked whether the trawlers and drifters engaged in patrol work in No. 1 district were armed with guns capable of engaging Zeppelins and fitted with night sights. Had it been reported that these trawlers and drifters were properly equipped and armed, and had the Admiralty taken steps to check the accuracy of the report? Were these boats supplied with navigating instruments, and, if not, why not? These were a few of the most important points affecting the lives and well-being of men who were daily and nightly suffering in the North Sea, suffering even more, in some cases, than the men in the trenches. For what purpose were these men called upon to suffer when they had not proper guns with which to protect the coasts or proper night sights? If certain types of absolutely useless hydroplanes

now in use could be adapted, as one had already been adapted by having its floats replaced by wheels, these machines could carry nearly 800 lb. of explosives, and could reach a speed of 80 miles an hour with a radius of action of 450 miles, and 800 lb. of trinitrotoluol dropped where it ought to have been dropped long ago would have a very useful influence in stopping air raids on this country. There were at this moment hundreds of these machines lying about our coasts. The seaplane had hardly on any occasion proved of utility in this war. We sent out three on a recent occasion, and they dropped down like shot ducks without reaching their objective.

He would suggest with some diffidence that if no one could organise these raids, if no one could see a way to strike back immediately with force and decision—then he suggested that he should ask that he might take leave from the House and be given an opportunity to organise such raids, and if necessary lead them. Provided the material, human and otherwise, that was lying around this country serving no useful purpose could be put at his disposal he thought he could suggest a way whereby we could "bag" as many Zeppelins in one day as we could in one year by misplaced guns, misplaced confidence, and seaplanes not fit for their work.

He was conscious that his methods in that House were not acceptable in every quarter. He did not speak as a politician, but the public were not looking to him to be a politician, but supported him because he claimed to know something about the job for which he came to that House. They were looking to him not to criticise the Government so much as to indicate some way out—to make some definite proposal—and he begged the Government to give him the opportunity of doing so.

MR. TENNANT'S REPLY

Mr. Tennant said he should like, if he could, to convince the House that the Government had been taking very active steps and did not require to be spurred in the least by speeches in that House. He had announced in that House—he thought that it was yesterday—that more than one raid on London was beaten off without the Londoners being in the least acquainted with the fact, without knowing that the attacks had been launched against them. (Hear, hear.) Moreover, other parts of the country had been armed and provided with the materials for resistance to air raids. Surely it was not necessary for him to say that it was not possible to prevent air raids taking place in any part of the United Kingdom. He hoped that the time would come when we should be able to meet the attacking ship or aeroplane very shortly after it had arrived, but to say that they should not be allowed to arrive here at all was to suggest what was impossible of attainment.

ANOTHER ZEPPELIN HIT

He thought that he might be allowed to inform the House that not only was the *L15* beaten down in the estuary of the Thames, but that another Zeppelin was hit somewhere up the coast of this country. (Cheers.) He did not think that it would be proper to give the names of places—(hear, hear)—but they had the knowledge of the fact from a message which was discovered—a wireless message sent by the commander of the airship which was not picked up in the ordinary sense by another wireless apparatus, but picked up from the ground—a carbon copy of the message written. That was news to the House, and good news so far as it went. (Cheers.) He would add that they were making every effort they could make. Anti-aircraft and anti-aircraft guns could not spring up from the ground, but everything was being done that was possible to secure at the earliest moment that the needs of the country should be met in this respect without in any way depleting the provision for the Forces at the front. Very great strides had been made in a short time, and it was not true to say that it was hopeless to try to defeat air raiders.

MR. BILLING'S OFFER

He certainly would accept the offer made by the hon. member for East Herts to help in making the air defence of the country more effective than it had been in the past; and would ascertain in what manner the hon. gentleman thought the best possible use could be made of his services. They also desired to say to the inhabitants of the raided towns that they had taken every step for their protection that could be taken within the means at their disposal. They had established a very considerable machine, which was much larger and wider than many hon. members knew of, or would readily believe in until they were actually aware of its ramifications; and they had great hopes of being able to perfect it in the near future more rapidly than they had been able to do in the past. They hoped the House would not deny them its confidence in their endeavours to carry out their duty under great difficulties and with not very great resources at their disposal owing to the difficulty of getting labour and material. In spite of all that, they were leaving nothing undone in the way of using all their resources in order to repel those dastardly raids. (Hear, hear.)

NAVAL AIRCRAFT

Dr. Macnamara said he thought the House knew that the Navy undertook to deal with hostile aircraft which attempted to reach this country, and that the Army undertook to deal with such craft as actually reached our shores. All defensive arrangements on land were undertaken by the Army Council, including the provision of aeroplanes and the protection of garrison and vulnerable points. The Admiralty undertook to provide the air-

craft required for operations with the Fleet and to control them, and, of course, the two Services co-operated. On the occasion of all of the last four air raids naval machines went up, as the Zeppelins came within reasonable distance of the naval air stations. One of the Zeppelins which took part in the first of those raids—that on the night of March 31—was hit by gunfire while over the Eastern Counties. The shells damaged the upper part of the ship, and after having been hit she dropped to a lower altitude, and finally came down into the sea off the coast of Kent. A machine-gun, a quantity of ammunition, and a petrol tank riddled by shrapnel were dropped either by that Zeppelin or another. Both of the two Zeppelins which passed over the Eastern Counties on the occasion of the third raid were engaged at various times by anti-aircraft artillery, and they appeared to have been prevented by that means for selecting any particular locality as their objective. These facts ought to be mentioned in any criticism on the ground of failure. The Zeppelin which made the fourth raid did not appear to have been long over land, although several explosions had been reported. His hon. friend had put a number of questions. He did not complain that he had not received notice of them, and he would go through them with the hon. member. His hon. friend had made comments on the inefficiency of seaplanes. He would take care that his hon. friend's conclusions should be communicated to those who were able to say what weight ought to attach to them. If any man could assist them in any way to meet this menace they would be most grateful for his contribution.

Sir A. Markham said he was told that the War Office and the Admiralty were building airships without the knowledge of each other—two lots of designers, two lots of people going abroad, one buying engines against the other, the Admiralty having trials of their own without the War Office being present.

Mr. Tennant asked the hon. member to put down a question on the subject. It was most desirable that such a statement should be met at once, but he was not able to give definite information at this moment, as he had had no notice.

Sir A. Markham said his information came from the highest authority as to the conditions prevailing a week ago.

April 6—*The Promised Air Debate*—Mr. Asquith, replying to Mr. R. M'Neill (U., Kent, St. Augustine's), said it was not possible to give the promised day for Mr. Joynson-Hicks's motion on the position of the Air Service before Easter.

Scope of Air Service Inquiry—Answering Mr. Billing (Ind., E. Herts), Mr. Asquith said he hoped to make the statement (promised by the Under-Secretary for War) on the nature and scope of the inquiry into the Air Service early next week.

Dr. Macnamara (L., N. Camberwell), replying to a question by Mr. Pemberton Billing with reference to British seaplanes captured in the raid on Schleswig, said the Government naturally had no information from the seaplanes in question. For the rest, his hon. friend, in common with all of them, had access to the statements which the enemy had published or allowed to be published.

Answering another question from the same hon. member with regard to the adoption of an aerial offensive, Dr. Macnamara said it was not desirable in the public interest to answer questions about future operations; but if the hon. member liked to ask him privately as to particular matters he would be happy to give his request every consideration.

A number of questions by Mr. Pemberton Billing are answered by Mr. Tennant in the Parliamentary papers of April 7.

Mr. Billing asked the Under-Secretary of State for War whether he has made inquiries and satisfied himself of the truth of the allegations respecting a dummy gun erected on the roof of a foundry in an East Coast city; could he give the number of soldiers who were told off to guard the gun during the time it was employed by the military; who was responsible for this hoax; and could he give the assurance that such a practice would not be repeated.

Mr. Tennant: As there are no orders extant which might cause the officer in charge of an anti-aircraft gun to act in such a way, and as the answer to the last part of the question is in the negative, there is no ground for supposing that anything of the kind occurred.

In answer to a further question, Mr. Tennant states: Principals and instructors of civilian schools of aviation will be called up under the Military Service Act, and, where possible, placed in the Royal Flying Corps, if unmarried and not attested, unless they have received certificates of exemption or have applied for exemption to a local tribunal.

Mr. Tennant gives the assurance that everything that is possible is being done to deal with Zeppelin raids and to secure at the earliest possible moment that the needs of the country shall be met without in any way depleting the provision for the Forces at the front.

In answer to Mr. Peto, who inquired whether two officers were turned out of their quarters at Chatham in order to accommodate two German officers rescued from the *L15*, Mr. Tennant says: Quarters of two British officers, who left temporarily for others which were vacant, were used for the detention of the German officers. There were special reasons for taking this course, which it is undesirable to make public. I must ask the hon. gentleman to accept this from me. The action taken in this case forms no precedent for similar cases in the future.

AIRCRAFT IN ACTION

OFFICIAL INFORMATION

ENGLAND

April 3—German Machine Brought Down—Yesterday (April 2) one of our aviators shot down a German machine in the neighbourhood of Lens. Another aviator attacked and drove off five hostile machines after close combat with two of them.

April 3—Raid by Six Zeppelins—War Office statement:—It appears that altogether six Zeppelins took part in the raid of Sunday night (April 2). Three of them raided the south-east counties of Scotland, one the north-east coast of England, and the remaining two the eastern counties of England. The vessels which raided Scotland crossed the coast at 9 p.m., 9.45 p.m., and 10.15 p.m. respectively, and cruised over the south-eastern counties of Scotland until about 1.10 a.m. Their course gave no indication of any special locality of attack, but in all 36 explosive and 17 incendiary bombs were dropped at various places, damaging some hotels and dwelling-houses. The following are the casualties which have been reported up to the present in Scotland:—

	Men.	Women.	Children.	Total.
Killed	7	—	3	10
Injured	5	2	4	11

One vessel visited the north-east coast and dropped 22 explosive and 15 incendiary bombs. The two remaining airships crossed the English coast at about 10.15 p.m., and cruised over the eastern counties until about 1 a.m. They were both engaged at various times by anti-aircraft artillery, and appear to have been prevented by this means from selecting any definite locality as their objective. Thirty-three explosive and 65 incendiary bombs were dropped by these two vessels. As far as can be ascertained no casualties were caused in England.

(See German official)

April 4—Enemy Machine Shot Down—Yesterday (April 3) a German machine was shot down by one of our aviators behind our lines south of Souchez. The pilot and observer were both killed.

April 5—Raid by Three Zeppelins—War Office statement:—The air raid of Monday night (April 3) on the north-eastern counties was apparently carried out by three Zeppelins. The first one made an attack about 9.10 p.m., but was driven off by the fire of anti-aircraft guns after dropping five bombs which caused no damage or casualties. Numerous observers state that this Zeppelin was struck by gun-fire. A second raider made his appearance in another locality about 10.15 p.m., and though he was in the neighbourhood for some time, no bombs were dropped. Another raider delivered an attack in a third locality during the night, but although several bombs were dropped, only slight material damage was caused. The total number of bombs dropped was 24 explosive and 24 incendiary, and the casualties at present reported are:

	Men.	Women.	Children.	Total.
Killed	—	—	1	1
Injured	2	1	5	8

No military damage was caused.

April 9—Fokker Pilot Captured—Yesterday (April 8) a Fokker monoplane came down in our lines. The pilot was taken prisoner and is unwounded.

FRANCE

April 3—Zeppelin Over Dunkirk—Last night (April 2) a Zeppelin dropped eight bombs on the town of Dunkirk, causing small material damage. Two civilians were killed and four injured.

April 3—German Aeroplane Captured—Near Noyon a German aeroplane fell in our lines; the aviators were captured.

April 3—Reprisal for Dunkirk—As a reprisal for the bombardment of Dunkirk by a Zeppelin last night (April 2) 31 Allied aircraft dropped 83 bombs of heavy calibre on the enemy cantonments of Keyem, Eessen, Terrest, and Houthulst. On the night of April 2-3 one of our air squadrons bombarded the station of Conflans. During the day numerous fights in the air took place successfully in the region of Verdun. Our airmen brought down four German machines. Other enemy aircraft were put to flight or forced to come to earth.

(Keyem and Eessen are behind the German lines between Dixmude and Nieuport.)

April 4—Dirigible Bombs Railway—Last night (April 3) one of our dirigibles dropped 34 bombs on the railway station of Audun-le-Roman.

April 5—Three Enemy Machines Brought Down—In the region of Verdun our pursuing aeroplanes on April 4 had 15 aerial encounters, in the course of which a German aeroplane with two engines was brought down near the pool of Hauts Fourneaux. Another enemy machine fell near the Bois de Tilly, while a third fell vertically to the ground. All our pilots returned safely. On Monday night (April 3) one of our air squadrons dropped 14 shells on the railway station of Nautillois and five on the bivouacs of Damvillers.

April 6—Aerial Superiority—During the month of March our military aircraft displayed great activity along the entire front, notably in the region of Verdun. In the course of many aerial engagements 31 German machines were brought down by our pilots, nine of which descended in flames or crashed to the ground within our lines, while 22 were brought down in the German lines. There is no doubt concerning the fate of these 22 machines which our pilots attacked over the enemy's lines. Twelve of these aeroplanes were seen coming down in flames, and 10 descended in headlong spirals under the fire of our airmen. Moreover, four German machines were brought down by our special guns, one in our lines in the neighbourhood of Avocourt and three in the enemy lines—one near Suippes, one near Nouvion, and one

near Sainte Marie-à-Py. To this total of 35 German machines destroyed during the month of March must be contrasted the figures of our aerial casualties, which amount to 13 machines lost, as follows:—One French machine brought down in our lines, and 12 French machines brought down in the German lines. The great disproportion existing both as regards our own machines and those of the Germans between the descents in the French zone and in the German zone is significant. According to a paper found on a prisoner, the German pilots are reported to have received orders to cross their own lines as little as possible. The balance for the month of March shows, on the contrary, that our chaser planes are constantly flying over the enemy's territory seeking a fight.

[This official French report is in answer to the absurd claim advanced by German headquarters. The whole question is dealt with exhaustively elsewhere in this issue.—Ed.]

RUSSIA

April 4—Enemy Aircraft Active—Enemy aviators flew over our cantonments at many points and dropped nine bombs on the town of Liakhovitchi (in the centre). Enemy aircraft dropped bombs on Rovno and Sarny.

April 5—Aircraft Active near Dvinsk—South of the Dvinsk region enemy aircraft were active, some of them dropping bombs or firing with their machine-guns. In the region east of Baranovitchi (in the centre) Zeppelins were reported on the night of the 4th inst.

April 7—Bomb on Chartoryisk—In the region north of Chartoryisk (on the Styr) enemy aviators dropped a bomb.

April 9—Airship Bombs Enemy Lines—Enemy aviators flew over many places on the Dvina front and dropped bombs. Our aviators made some successful flights. In the Riga region one of our airships of the Ilya Mouromets type flew over the enemy's lines and dropped bombs on his cantonments.

ITALY

April 3—Raid near Trieste—On Saturday night (April 1) one of our dirigibles succeeded in reaching the railway junction at Opicina, north of Trieste, on which it dropped 800 kilogrammes (16cwt.) of high explosives. Although made a target for the fire of numerous enemy batteries it succeeded in regaining our lines safely. This morning (April 3) six Caproni aeroplanes made a daring raid on the important railway station at Adelsberg and the seat of a high Austrian command. They dropped 40 bombs, causing big outbreaks of fire. Our aviators, on being attacked by enemy aviators, brilliantly repulsed them and returned safely.

April 3—Raid on Ancona—It is officially announced that at about half-past three this afternoon (April 3) five enemy seaplanes supported by two torpedo-boats, which kept well off from the coast, appeared over Ancona. Attacked by anti-aircraft guns, an armoured train, and four Italian aeroplanes, the raiders fled, but three were brought down. One fell in the sea and was captured, the second fell in flames into the water, and the third sank while being conveyed to port. Three persons were killed and 11 injured. The damage done to property is unimportant.

April 4—Futile Enemy Attacks—Enemy aeroplanes attempted obstinate attacks on our territory, but were repulsed by our artillery fire and counter-attacked by our aircraft. One aeroplane succeeded in dropping two bombs on Bassano, causing only very slight damage. One of our Caproni machines dropped a heavy bomb on Grafenberg (Gorizia), causing a fire.

April 5—Failure of Austrian Attacks—Enemy aircraft yesterday (April 4) attempted to make their way to Verona, but they were immediately driven back to the north. Other aircraft succeeded in dropping a few bombs on Bassano, killing two children. A raid was also attempted in the Lower Isonzo zone and on Grado, a few bombs being dropped on some hamlets. Our artillery and defence squadrons drove back the enemy aircraft, two of which were seen to come down suddenly near their own lines.

April 7—Night Attack Driven off—The fighting in the air has been marked by fresh brilliant successes for us. Already yesterday (April 6) effective raids by enemy aeroplanes in Carnia and on the Isonzo had been repulsed. Despairing of forcing our air defence, the enemy attempted to surprise us by taking advantage of the dark, and last night (April 6) seven enemy aeroplanes made a raid on a plain between the Isonzo and the Tagliamento, but our brave aviators rose quickly in the dark, and attacked and repulsed the enemy squadron, bringing down two aeroplanes, and capturing four aviators, of whom three were officers.

GALLIPOLI

April 7—Enemy Aeroplane Brought Down—Turkish official: On Tuesday last (April 4) eight enemy aeroplanes flew over Gallipoli. Captain Buddecke attacked them, and in the course of an aerial fight, shot down an enemy aeroplane. The search of the enemy's torpedo-boats, which came to its assistance, was fruitless.

MESOPOTAMIA

April 5—Aircraft Work in Mesopotamia—From General Sir John Nixon's despatch to the Indian Government, dated January 1, 1916:—

An aeroplane reconnaissance on the morning of June 1 discovered that the enemy had evacuated his main position, and was in full retreat up the Tigris.

I have to place on record the excellence of the work performed by the officers and men of the Royal Flying Corps, whose valuable reconnaissances materially assisted in clearing up the situation before the battle of July 24.

During the advance on Kut-al-Amarah a few skirmishes had taken place between our cavalry and that of the enemy, and constant naval and air reconnaissances were made. Accurate information was gained regarding the dispositions of the enemy. The work performed by the Royal Flying Corps during this period was invaluable.

DISTINGUISHED SERVICES.—The services of the Royal Flying Corps, not only during the battle but also in the frequent reconnaissances which preceded the fighting, also call for notice. The Flying Officers displayed courage and devotion in the performance of their duties, which were often carried out under a heavy fire. The accurate information obtained during air reconnaissances was of the utmost value in planning the defeat of the enemy, and the remarkable skill and powers of observation displayed by Flight Commander Major H. L. Reilly, Royal Flying Corps, contributed in no small degree to the success of the operations.

April 6—Aerial Reconnaissance at Kut—War Office announcement :—Aeroplane reconnaissances then reported that the enemy was strongly reinforcing his entrenchments at the Falahiyah and Sanna-i-yat positions, respectively 6,000 and 12,000 yards from the front trenches at Umm-el-Hannah. As these positions could only be approached over very open ground, General Goringe ordered further attack to be deferred till the evening.

April 7—Enemy Aeroplane Brought Down—Turkish official : In fighting on April 5 and 6, in some trenches occupied by one of our flying detachments on an advanced line $2\frac{1}{2}$ miles east of our main sector at Belahieh, we killed and wounded 1,500 of the enemy and took some prisoners. One aeroplane was brought down.

SWITZERLAND

March 31—Neutrality Violated—This morning (March 31) at five o'clock two foreign aeroplanes, whose nationality has not yet been established, flew over Porrentruy and threw five bombs, causing, how-

April 4—Raid on East Coast of England—Berlin official :—For the third time, on the night of April 2-3, a naval air squadron attacked the English east coast, this time the northern part. Edinburgh and Leith, with the docks on the Firth of Forth, Newcastle, and important wharves and buildings, blast furnaces, and factories on the Tyne were bombarded with numerous explosive and incendiary bombs with very good results. Heavy explosions with extensive collapses were observed. A battery near Newcastle was silenced. In spite of the heavy bombardment all the airships safely returned and landed.

(See English official)

April 4—Raid on Yarmouth—The Naval Headquarters Staff reports on the night of April 3 an attack by one of our naval air squadrons was carried out on the south-east coast of England. Explosive bombs were dropped on the fortifications near Great Yarmouth. In spite of heavy fire from anti-aircraft guns our airships returned in safety.

Another version of the above statement, dated April 4, and circulated through the German wireless stations, has been received by the Wireless Press :—

Berlin Official.—During the naval airship attack in the night of April 3-4 on the English south-east coast explosive bombs were dropped on the fortification works near Great Yarmouth. The airships returned undamaged, notwithstanding the enemy bombardment.

April 5—Aerial Losses for March—The following are the losses of the aerial battles on the western front during March :—

How lost.	German.	French and British.
In aerial battles	7	38
Shot down from the earth	3	4
Missing	4	—
Involuntary descent in German lines	—	2
Totals	14	44

Twenty-five of these enemy aeroplanes fell into our hands. The descent of the other 19 machines has been observed without leaving any doubt.



[Photo]

THE STAFF AT THE WHITEHEAD AIRCRAFT CO.

[Topical Press

ever, little damage. An inquiry has been opened. Contrary to the belief at first expressed, it now appears to be established that the aviators were of German nationality. Examination of some unexploded bombs has, in fact, led to the discovery on the zinc covering of an inscription in German on red paper giving instructions as to the method of using the bombs. The Federal Council instructed the Swiss Minister in Berlin to lodge a strong protest against this fresh violation of neutrality, and to demand prompt and complete satisfaction as well as the severe punishment of the aviators responsible and compensation for the material damage caused.

April 3—Germany's Apology—The Imperial German Government, through its representative at Berne, has informed the Swiss Federal Council that the result of the inquiry ordered by it has shown that the aviators who dropped bombs on the Swiss village of Porrentruy on March 31 were Germans, who had completely lost their bearing and believed themselves to be over Belfort. The Imperial Government expresses to the Federal Council its deepest regrets and informs it that the aviators who were responsible will be punished and removed.

GERMANY

April 2—Raid on English Coast—Berlin official :—During the night of April 1-2 a fresh attack was made on the English east coast. Blast furnaces, great iron foundries, and industrial works on the south bank of the river Tees and harbour buildings near Middlesbrough and Sunderland were bombarded for an hour and a half with explosive and incendiary bombs. Violent explosions, the collapse of buildings, and the outbreak of fires clearly indicated the good effect of our attacks. In spite of a vigorous anti-aircraft bombardment, we suffered neither loss nor damage.—CHIEF OF THE ADMIRALTY STAFF.

April 2—Army and naval airships attacked during the night the docks of London and other important military points on the English coast, as well as Dunkirk.—CHIEF OF ARMY ADMINISTRATION.
(See English official.)

April 6—The following official *communiqué* was issued in Berlin to-day :—

Naval airships on the night of April 5-6 destroyed large ironworks near Whitby and extensive buildings with blast-furnaces, after previously pelting with explosive bombs and placing out of action a battery north of Hull. Furthermore, the factories of Leeds and the environs, and a number of railway stations in the industrial district, were attacked. Very good effects were observed. The airships were heavily bombarded. All landed undamaged.—(Signed) CHIEF OF THE ADMIRALTY STAFF OF THE NAVY.

[We are officially informed that the above is absolutely inaccurate, the object of the Germans being to obscure their failure by a tissue of lies.]

April 9—Raid on Russian Naval Base—On Saturday (April 8) four of our naval aeroplanes attacked the Russian aerodrome at Papensholm, near Kielkond on Oesel (the large island at the entrance to the Gulf of Riga). Twenty bombs were dropped. Two out of four enemy aeroplanes which went up were forced to descend. In spite of heavy fire from anti-aircraft guns our aeroplanes returned safely.

SIX AEROPLANES FROM MALAYA—In addition to over £15,000 previously subscribed, £10,500 has been collected in the Straits Settlements and the Federated Malay States for the purchase of six more aeroplanes, which will be numbered "Malaya 11" to "Malaya 16," for the use of the Royal Flying Corps. Mr. C. Alma Baker, of Kinta, who is the organiser of the fund, and has himself given one aeroplane, is the donor of a second aeroplane.

AEROPLANE FOR LIEUTENANT BRANDON—Mr. A. M. Myers, the New Zealand Minister of Munitions, is opening a fund to purchase an aeroplane which is to be sent to Lieutenant Brandon, of the Royal Flying Corps, who on the night of March 31 attacked a Zeppelin and dropped several bombs on it.

HONOURS FOR THE R.N.A.S.

D.S.O.

Lieut. Reginald John Bone, R.N., Flight Commander, R.N.A.S.

In recognition of his services on March 19, 1916, when, flying a land machine, and unaccompanied by an observer, he chased out to sea, and after bold and skilful manœuvring disabled and brought down by gunfire a German seaplane, which had been engaged in a raid on the coast of Kent.

MENTIONED IN DESPATCHES

The following members of the Air Services are mentioned in General Sir John Nixon's despatch of January 1, 1916:—

Operations Amara—May 31-June 4, 1915

Royal Flying Corps—Major P. W. L. Broke-Smith, Lieut. W. W. A. Burn (since killed), Capt. H. Petre, Major H. L. Reilly.

Euphrates Operations—June 26-July 25, 1915

Royal Flying Corps—Capt. B. S. Atkins, 11th Rajputs (attached), Lieut. W. W. A. Burn (since killed), Lieut. G. F. Merz (since killed), Capt. W. G. Palmer, 113th Infantry (attached), Major H. L. Reilly, Lieut. T. R. Wells, No. 2 Staff Serg. C. V. Heath, No. 4473 Serg. T. N. Palmer, No. 4474 Serg. R. J. Tomlinson.

Operations Kut-al-Amara—September 28, 1915

Royal Naval Air Service—Lieut. V. G. Blackburn, Major R. Gordon.

Royal Flying Corps—Lieut. E. J. Fulton, Capt. H. Petre, Major H. L. Reilly, Capt. F. C. C. Yeats-Brown (17th Cavalry) attached, 4473 Serg. T. N. Palmer, 6 First Class Mech. C. E. Wardell.

CASUALTIES

ROYAL NAVAL AIR SERVICE

INJURED

April 3

Henley, Flight Lieut. Harold G., R.N.

ROYAL FLYING CORPS

KILLED

April 1

Bavin, Second Lieut. G. W., R.F.C.

WOUNDED

Undated

Powell-Whittaker, Capt. J. T., A.S.C. and R.F.C.
Greenwood, 2883 First Class Air Mech. G., R.F.C.
Ward, Capt. D. C., King's (Liverpool Regt.) and R.F.C.

MISSING

Undated

Castle, Second Lieut. J. S., R.F.C.
Frost, Second Lieut. H. G., Suffolk Regt., attached R.F.C.
Grimwade, Second Lieut. F. N., R.F.C.

UNOFFICIALLY REPORTED KILLED

Taylor, Lieut. D. P. B., Hussars and R.F.C.
Lieut. Denis Percival Beauchamp Taylor, Hussars and Royal Flying Corps, previously reported missing, is now reported to have been killed on March 14. The only son of Col. P. B. Taylor, late R.H.A., he was born in 1894 and obtained his first appointment in September, 1913. In November, 1914, he was promoted temporary lieutenant. He was awarded the Military Cross.

Welsford, Second Lieut. G. J. L., Middlesex Regiment and R.F.C.

Second Lieut. G. J. L. Welsford, Middlesex Regiment and Royal Flying Corps, officially reported missing on March 31, is now stated to have been killed while flying on March 30. Second Lieut. Welsford, who was 20 years old, was the only son of the late J. W. W. Welsford, assistant master in Harrow School and Fellow of Caius College, Cambridge, and of Mrs. E. W. Freeborn, and stepson of Major E. W. Freeborn, of Harrow. He was educated at Orley Farm School, Harrow, at Marlborough College, Berlin—Lichterselde-West—and Caius College, Cambridge. He joined the Middlesex Regiment, and was wounded on May 9. During his convalescence he took his pilot's certificate at Hendon. He returned to the front for three weeks and was then recalled to be transferred to the Royal Flying Corps and to be trained. He was appointed pilot and returned again to the front on February 24.

March 5

Palmer, Capt. W. G., Infantry, I.A., attached R.F.C.

Captain Walter Gerard Palmer, Infantry, Indian Army, attached Royal Flying Corps, who was killed on March 5, aged 32 years, was the second son of the late C. E. Palmer and Mrs. Palmer, of Instow. He obtained his first commission in January, 1903, and was gazetted to the Indian Army in the following year. He was promoted captain in January, 1912.

The following appeared in the obituary columns of the *Times* of April 8:—

WILSON-WALKER—On March 20, accidentally killed whilst flying at Dover, Second Lieut. Allan A. Wilson-Walker, eldest son of the late A. Wilson and of Mrs. Charles Walker, of Pymble, Sydney, Australia.

The following appeared in the obituary columns of the *Times* of April 10:—

MAWSON—On April 6, at Salisbury Camp, of pneumonia, John A. W. Mawson (Solicitor), Royal Flying Corps, only son of William Mawson, Bondgate House, Ripon, aged 27.

NAVAL DETAILS WITH EXPEDITIONARY FORCE

Kite Balloon Section, R.N.A.S.

KILLED (ACCIDENTALLY)

Undated

Biddlecombe, F., Air Mech., First Class, F.4493.

R.M.A. Anti-Aircraft Brigade

SLIGHTLY WOUNDED

Britnell, J., Drvr., R.M.A., R.M.A./486 (S.).

FLYING OFFICER KILLED

An inquest was held at a north country village, on April 7, on the body of Flight Lieut. John Nichol, 22, of Margate. The evidence showed that he was killed while starting on a reconnaissance flight. He was stated to have shown great skill and judgment in attacking hostile aircraft. A verdict of accidental death was returned.

R.F.C. FATALITY AT UPAVON

A verdict of "Accidental death" was returned at an inquest held at the Central Flying School, Upavon, Wilts, on April 3, on the body of Second Lieutenant Geoffrey Wynne Bavin, Lincolnshire Regiment, who was killed while flying on Upavon Downs on Saturday morning (April 1). Mr. Bavin had been at the flying school since December. The machine he was using was a new one, having been brought from Farnborough only the day before, and was stated to have been well constructed. No one saw him actually fall, but when an officer went to his assistance he found him quite dead, his skull being fractured. The machine was completely smashed.

Second Lieutenant Bavin was the third son of Captain and Mrs. Bavin, of Berkhamstead School.

APPOINTMENTS

ROYAL NAVAL AIR SERVICE

Temp. Lieuts. (R.N.V.R.):

W. H. Strettell-Miller, transferred to R.N.A.S., as Probationary Flight Sub-Lieut. (temp.), with seniority of March 18, and appointed to *President*, additional, for R.N.A.S.

K. D. Doyle and F. Shepherd, both granted temporary commissions as Lieut. (R.N.V.R.), with seniority of March 18, and appointed to *President*, additional, for R.N.A.S.

E. H. Arnott, with seniority of March 20, and appointed to *President*, for R.N.A.S.; W. D. Longfield, with seniority of March 20, and appointed to *President*, additional, for R.N.A.S.: March 27.

The following Flight Sub-Lieuts. have been promoted to the rank of Flight Lieut.:

T. C. Vernon and B. C. Windeler (for temp. service): January 1.

The following Flight Sub-Lieuts. have been promoted to Flight Lieuts., with seniority of April 1:

R. C. Petter, H. R. Hopperton, C. Tollemache, W. H. Dunne, G. Donald, F. J. E. Feeny, R. M. Everett, J. F. Hay, R. B. Munday, G. H. Jackson, R. T. H. Duff, J. Forgan Potts, G. G. Dawson, J. P. Coleman, W. H. E. Campbell, J. S. Wheelwright, R. F. S. Leslie, F. H. M. Maynard, H. G. Henley, and F. J. Linnell.

The following Flight Sub-Lieuts. (temp.) have been promoted to Flight Lieuts. (temp.), with seniority of April 1:

R. A. Reid, B. P. H. de Roeper, B. C. Bell, G. R. H. Talbot, and P. C. D. Douglass.

R. W. Anderson, entered as Probationary Flight Sub-Lieut. (temp.), with seniority of March 31, and appointed to *President*, additional, for R.N.A.S.

R. E. Goddard granted a temp. commission as Lieut. (R.N.V.R.), with seniority of March 31, and appointed to *President*, additional, for R.N.A.S.

Commander James Louis Forbes to be Wing Commander: March 16.

Probationary Flight Sub-Lieut.:

A. Mann, to *President*, additional, for R.N.A.S.: March 23.

Temp. Probationary Flight Sub-Lieut.:

J. K. Cronyn, late Capt. Canadian Inf., entered as Probationary Flight Sub-Lieut. (temp.), with seniority of March 1, and appointed to *President*, for R.N.A.S.

Temp. Probationary Flight Sub-Lieuts. with seniority of April 3, and appointed to President II., additional, for R.N.A.S.:

S. J. Fetherston, L. N. Glaisby, E. Greenwood, W. O. Dickinson, C. P. O. Bartlett, W. E. C. B. C. Forsyth, H. T. Mellings, R. M. Hughes, S. L. Wallers, C. Huddy, and R. J. Paul.

Mr. C. de Hoghton, entered as Sub-Lieut. (R.N.V.R.) (temp.), with seniority of March 28, and appointed to *President*, additional, for R.N.A.S.: March 30.

Temp. Sub-Lieut. (R.N.V.R.):

V. E. Dean, transferred to R.N.A.S., as Probationary Flight Sub-Lieut. (temp.), with seniority of March 25.

The following have been entered as Probationary Flight Sub-Lieuts., with seniority of February 29, and all appointed to "President," additional, for R.N.A.S.:

J. F. Clusholm, A. T. Whealey, and C. L. Bailey.

ROYAL MARINES

The temporary commission and appointment of following officer is terminated from March 14 on return to Army Service:

Col. Second Commandant F. H. Sykes, Wing Capt., R.N.A.S.

ROYAL FLYING CORPS

Squadron Commander:

Temp. Capt. F. H. Cleaver, General List, from a Flight Commander, and to be Temp. Major whilst so employed: March 16.

Squadron Commanders (from Flight Commanders):

Maj. B. F. Vernon-Harcourt, Welsh Regt; Maj. T. C. R. Higgins, K.O. (Royal Lancaster Regt.): March 1.

Squadron Commanders (from Flight Commanders), and to be Temp. Majors whilst so employed:

Capt. A. C. Boddam-Welsham, Argyll and Sutherland Highlanders, S.R.; Lieut. (Temp. Capt.) W. R. Read, 1st Dragoon Guards; Capt. W. G. S. Mitchell, Highland L.I.; Lieut. (temp. Capt.) G. J. Malcolm, R.A.; Capt. W. H. C. Mansfield, D.S.O., King's (Shropshire L.I.); Lieut. (Temp. Capt.) A. S. Barratt, R.A.: March 1.

Flight Commander:

Temp. Second Lieut. C. H. R. Johnstone, General List, from a Flying Officer, and to be Temp. Capt. whilst so employed: March 4.

Lieut. J. W. Woodhouse, S.R., from a Flying Officer, and to be Temp. Capt. whilst so employed: March 15.

Temp. Capt. V. A. Beaufort, Devonshire Regt., from a Balloon Officer: March 16.

Capt. J. C. Elv, Wiltshire Regt., from a Flying Officer: March 18.

Flight Commanders (from Flying Officers):

Temp. Capt. Lord Lucas, Hampshire Yeo., T.F.; Capt. H. J. Collins, Hampshire Regt., S.R.: March 1.

Flight Commanders (from Flying Officers), and to be Temp. Capt. whilst so employed:

Lieut. F. W. Gooden, S.R.: February 15.

Lieut. G. Wenden, Border Regt.: February 23.

Lieut. W. H. Furlonger, S.R., from a Balloon Officer: February 24.

Lieut. G. R. Elliott, 3rd Dragoon Guards; Lieut. L. F. Richard, R.A.; Lieut. G. G. A. Williams, 5th Dragoon Guards, S.R.; Temp. Lieut. A. E. G. MacCallum, General List; Lieut. D. M. King, Res. of Offrs.; Lieut. G. Allen, Connaught Rangers; Lieut. J. V. Steel, R.A.; Lieut. L. W. F. Turner, S.R.; Lieut. R. A. Archer, R.A.; Lieut. G. A. Turton, Yorkshire Regt.; Lieut. F. Dunn, S.R.: March 1.

Second Lieut. A. R. Tillie, Cameronians, T.F.; Second Lieut. W. G. B. Williams, S.R.: March 8.

Temp. Capt. A. H. Jackson, Sherwood Foresters: March 14.

Wing Adjutants:

Lieut. D. M. V. Veitch, 1st Duke of York's Own Lancers, I.A., and to be Temp. Capt. whilst so employed, vice Temp. Capt. C. F. Lee, W. Somersetshire Yeo., T.F.: from December 20 to February 24 (subst. for notification of March 7).

Flying Officers:

Capt. T. R. Dowdeswell, Welsh Regt., T.F.: March 18.

Temp. Capt. H. L. Edgar, Cheshire Regt., T.F.; Temp. Lieut. T. A. Tillard, Norfolk Yeo., T.F.; Temp. Lieut. A. H. T. L. Speer, R.F.A., T.F.; Second Lieut. E. D. Le Sauvage, Dorsetshire Regt., and to be seconded; Second Lieut. R. C. Gallop, Cameronians, and to be seconded; Temp. Second Lieut. H. L. Chadwick, Royal Warwickshire Regt., and to be transferred to General List; Temp. Second Lieut. F. H. Coleman, Middlesex Regt., and to be transferred to General List.

That part of the notification in *Gazette* of November 12, transferring Temp. Second Lieut. R. L. Johnston to General List is cancelled.

Temp. Second Lieut. H. P. Lowe, General List: February 10.

Second Lieut. J. D. Latta, S.R.: February 24.

Second Lieut. C. L. H. Hicks, S.R.: March 12.

Lieut. H. V. Acland, 3rd Canadian Pioneer Bn.: March 1.

Temp. Second Lieut. J. M. Child, Durham L.I., and to be transferred to the General List; Temp. Second Lieut. M. D. Barber, King's Own (Yorkshire L.I.), and to be transferred to the General List; Second Lieut. G. H. B. Dent, Herts Yeomanry, T.F.; Second Lieut. R. D. Belamy, Essex Regt., and to be seconded; Temp. Second Lieut. L. O. Crowther, Queen's Own (Royal West Kent Regt.), and to be transferred to the General List; Second Lieuts., S.R., W. H. Tolhurst, M. V. Morgan, H. J. N. Drope: March 2.

Lieut. J. K. Law, Royal Fus. (City of London Regt.), S.R., and to be seconded; Temp. Lieut. J. R. Burns, Cameronians, T.F.; Second Lieut. K. Mathewson, S.R.; Second Lieut. C. W. P. May, Royal Irish Rifles, S.R., and to be seconded; Temp. Second Lieut. A. L. Findlay, General List, from a Flying Officer (Observer): March 7.

Flying Officers (Observers):

Second Lieut. M. A. A. Lillis, Royal Irish Regt., from a Flying Officer: February 17.

Temp. Second Lieut. C. A. Brewster-Joske, Motor Machine-Gun Service, and to be transferred to the General List; Temp. Second Lieut. F. C. Butler, General List: February 27.

Capt. A. A. Walser, London Regt., T.F.: October 21.

Balloon Officers:

Temp. Lieut. N. J. A. L. Prinsep, Royal Scots Fus., and to be transferred to General List: February 10.

Second Lieut. F. C. E. Liardet, Devonshire Regt., T.F.: February 28.

Second Lieut. B. H. Sisson, R.G.A., S.R.: March 10.

Second Lieut. G. B. Robotham, Sherwood Foresters, T.F.; Second Lieut. K. C. Cleaver, S.R.: March 1.

Equipment Officer:

Temp. Capt. C. E. Gardner, Gloucestershire Regt., from an Assistant Equipment Officer: March 17.

Equipment Officers (from Assistant Equipment Officers) and to be Temp. Capt. whilst so employed:

Temp. Lieut. A. C. S. Couduwel, General List: February 6.

Lieut. L. M. Bennett, S.R.: February 9.

To be Temp. Second Lieut. for duty with the Military Wing:

Flight-Serg. S. E. Devonald, from R.F.C.: March 11.

Capt. H. M. Meyler, Border Regt., and to be seconded, vice Capt. V. H. Secker, 14th Hussars: March 4.

To be Temporary Second Lieuts.:

Act. Serg.-Maj. J. R. Grant, R.F.C., for duty with the Military Wing of that Corps: March 11.

Pte. H. O. W. Hill, from Manchester University O.T.C., for duty with R.F.C.: March 19.

PROGRESS AT THE FLYING SCHOOLS

HENDON AERODROME—The Grahame-White Civilian School—Report for week ended March 31—Straights with instructor: Box, Forster, Scheidt, Sloden, Smith, Spencer. Circuits with instructor: Butler, Eichelbrenner, F. Williams, and Walk. Eights with instructor: Baragar, Franck, Grasset, Holman, Kryn, Sandys, and S. Williams. Instructors for week: Biard, Hale, Manton, Pashley, Russell, and Winter.

School notes for the week ended April 7, 1916: **Civilian School**—Straights with Instructor—Baragar, Box, Forster, Matthews, Smith, Timmis, Williams, F., Williams, S., and Holman. Eights with Instructor—Franck and Leigh. Brevet during week—Grasset, Butler, Rigby and Tanner.

London and Provincial School—School report: Instructors—W. T. Warren, M. G. Smiles, G. V. Aimer, H. Sykes, and W. T. Warren, jun., Pupils doing straights—Archer, Creaghan, Hay, Rimer, Moore, Ferris. Houba, de Goussencourt and Dawson. Pupils doing half-circuits—Creaghan, Archer and Jennings.

The Hall School—Instructors for the week—H. F. Stevens, C. M. Hill, A. Chave. The following pupils were out receiving instruction: Cosgrave, Smith, Hooker, Roberts, Neal, Mahoney, Halliday, Chapman, Bennett, Taylor, Worswick, Osmond, Glegg, Le Grice, Gudger, Rayne, Robinson, Duncan, Dickson, Pennell, Nicolle, Dresser. An excellent certificate was taken by Lieut. Cooke.

LEGAL NEWS

PROPELLERS IN COURT

In a claim for wages by a mechanic at Westminster County Court on April 5, the defendants brought into Court the propellers of an aeroplane as evidence of bad workmanship, which caused the rejection of the machine by the French Government.

DOPE POISONING

At Peterborough, on March 7, an inquest was held relative to the death of a painter named John Jas. Steels, aged 63, who was in the employ of Sage, Ltd., and died on March 5.

The widow stated that deceased had been with the firm since last November. He was then in good health, and three weeks later he told witness that if he did not leave the job it would kill him. He gradually grew worse, and gave up work a fortnight prior to his death. She admitted that no notice was given the firm in writing that her husband was ill.

Dr. W. Croxford deposed that on February 22 deceased visited him in a dyspeptic condition. He complained that a composition in the paint had upset him. Witness prescribed for him, and gave him a certificate to the effect that he was suffering from a congested liver. On Friday he was sent for, and found jaundice commencing. This became more pronounced, and his intellect became more drowsy and less clear until the end, when he was quite moribund. Witness attended him up to his death. Dr. Alec Walker conducted a post-mortem that morning in his presence. The organs of the body were in a healthy condition.

with the exception of the liver and both kidneys, which showed signs of fatty degeneration. The man died from dope or tetrachloride of ethane poisoning, followed by toxic jaundice. A poison would be taken with very strong and marked dyspeptic symptoms, and after two or three days would develop jaundice, which would become much more marked as the days went on. Fatty degeneration of the liver cells would rapidly ensue, followed by that of the kidneys, and death would very shortly take place from stupor.

Dr. Alec Walker stated that he had made a post-mortem examination in conjunction with Dr. Croxford, and found that the liver and kidneys showed recent changes of fatty degeneration, and there was atrophy of the liver. The other organs were healthy. In his opinion death was due to toxic poisoning of the liver, no doubt through tetrachloride. His attention was called to the case as soon as Messrs. Sage were aware of its existence. He had examined the works, and Messrs. Sage had taken every precaution to guard against danger from this poisoning. As certifying surgeon under the Factory Act he was satisfied with all the arrangements he found.

Magnus Hermann Volk, superintendent of the department in which deceased worked at Messrs. Sage's, stated that tetrachloride of ethane had been in use at the works since July. On February 24 the regulations governing its use were handed to him. They had been carried out by the men, who had not appeared to suffer any ill effects. They were changing the air in this particular factory 60 times an hour. On March 2 it came to his notice that Steels was away ill, and he at once notified Dr. Walker. On receiving new instructions a day or two previous to this, they found the men had their meals in the dope shop. The reason they gave for this was that it was warmer. They employed 20 men in the dope shop, and Steels was the first to show any ill effects through working there. Immediately he knew the men were having their meals in the dope shop he stopped it.

Evidence was also given by Mr. E. Gordon England, who said steps had been taken warning the men as to the use of the dope paint. The men had always known it was dangerous from the fact that fans were there to change the air.

Mr. Nicholl, inspector of factories, said he had inspected the factory, and in view of the death having occurred, he had reported the facts to the Home Office. In reply to the foreman, the inspector said he believed Sage, Ltd., had complied with the factory Act.

The Foreman said the jury were of opinion that deceased died from toxic jaundice following dope poisoning. They thought it was a pity the man had his meals there, but agreed that the firm had no knowledge of that fact at the time.

A verdict was returned accordingly.

Another case of dope poisoning was investigated at West Ham on March 10, during an inquest on the death of Ellen Jane Clark, aged 20, who had been employed by a firm in the district on varnishing work.

The Coroner said it was alleged that the deceased died as a result of inhaling fumes during her employment.

Dr. Legge represented the Home Office.

The mother stated that the girl was quite healthy until about five weeks ago. About five months ago she was put on to the work of varnishing, having been previously engaged in the paint department of the same firm.

On February 23 six of the girls in that department were medically examined, and as a result deceased was removed to another department. The girl worked from 6 a.m. to 6 p.m., and 6 a.m. to 1 p.m. on Saturdays, and occasionally she had worked overtime.

Stewart Russell, works manager to the firm, described the work performed by the deceased. Canvas surfaces had to be

"doped," and after that other preparation affixed to each side. It was thought that the arrangements were quite satisfactory, but since this unfortunate case the Home Office had been communicated with, with view to improvement.

The Coroner: Did you know that this work was dangerous?

Witness: The first knowledge we had of it was at the beginning of 1915, and we gave orders for a fan to be fitted, so as to carry the fumes away from the workers. Witness went on to state that other precautions were subsequently taken, and certain suggestions of the Home Office adopted. When the medical examination took place the doctor found symptoms which led him to order the girl to cease that work. In reply to Dr. Legge, witness mentioned several plans that had been adopted for the purposes of ventilation, but admitted that no ventilating engineer had been consulted.

Dr. Legge: You are quite prepared to alter the system of ventilation?—Oh, yes. And until that is done, will you give an undertaking that no girl shall be employed on this work more than one day a week?—Yes; the girls will do half a day's work twice a week.

Dr. Fredericks said he had treated the deceased for gastritis, and recently found her jaundiced and dropsical. The post-mortem examination showed the body to be extensively jaundiced and dropsical. The heart and lungs were slightly affected, and the liver was considerably shrunk. Death was due to acute yellow atrophy, but as to the effect of this poison he was not in a position to say.

The Coroner remarked that this was a new trade, and as practically nothing was known about it it was not yet possible for the Home Office to make regulations regarding its use.

The jury returned a verdict in accordance with the medical evidence, and recommended the Home Office to take steps with a view to preventing a recurrence.

TRIPLEX SAFETY GLASS

The following remarkable testimonial has been received by the Triplex Safety Glass Co., Ltd:—

Wimpole Street, Cavendish Square, W.,

March 8, 1916

DEAR SIRs,—On January 23, 1916, a motor-bus, belonging to the L.G.O.C., Ltd., skidded into my landaulette, which was fitted with Triplex glass. Although my car was very seriously damaged, not a piece of glass became detached from any of the five windows or windscreen, in spite of the fact that one was cracked all over.

I was flung into the large window in front and stunned, and the window was badly cracked; but, owing to the fact that it did not break, I was not cut, although the serious disfigurement due to bruising lasted several days. I think it practically certain that *if this window had been fitted with ordinary plate glass I should have been fatally injured*, as my head must then have been forced through the glass, with the most likely result that the main arteries of my neck would have been severed. Indeed, *this very accident and result* happened to a doctor in London the week I met with my accident.

It may interest you to know that I had Triplex glass fitted to my car *after a lady had been brought into my hospital fatally injured by a piece of plate glass* which had become detached from the window of her car in a collision.

You are at liberty to make what use you wish of this letter, on the distinct understanding that you delete my name and address if you ever use it or a printed advertisement; also you must not expose this letter to the public gaze, but I have no objection to you showing it to any bona fide inquirer.

Yours faithfully,

(Signed) _____.

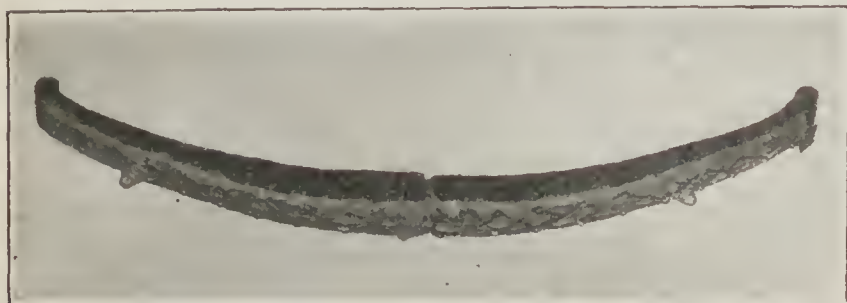


TRIPLEX GLASS SHIELD

THE "DUCO" SPRING GAITER

Springs are one of those elusive parts of a car which are usually taken for granted, although almost everything in the way of comfort and efficiency of running depend upon them. The motor-car manufacturer in setting his hand to designing motor-car suspension springs simply adopted the old carriage or laminated spring as his standard, forgetful of the fact that a car's springing system is constantly at work, and hence that its labours have to be softened as much as those of any other of the working parts of the engine. In other words, a car's springs should be greased and lubricated according to the most efficient methods known.

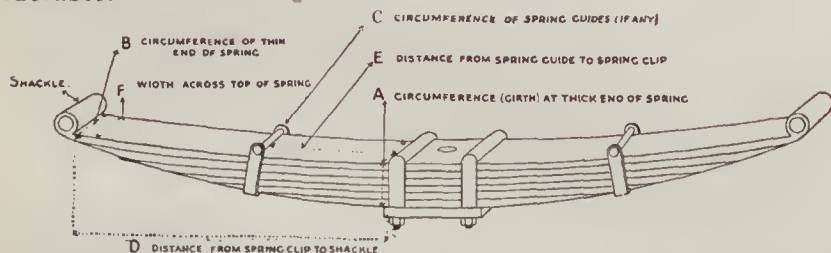
Realising this fact, a Mr. Joseph, a private motorist, evolved a design for lubricating a car springing; this device proved so successful and effective that he was induced to protect his idea, which has now been acquired by Messrs. Brown Bros. The accompanying photograph and diagram illustrate the details of the "Duco" grease-retaining gaiter for motor-car springs.



THE "DUCO" SPRING GAITER

The gaiter is a sheath or covering for the springs, protecting them from dust and mud and water, and at the same time permitting them to work in a perpetual bath of grease. The gaiter therefore is not a mere bandage, but a flexible, weatherproof, grease-retaining sheath made of black leather and reinforced with felt inside, leaving a channel for the grease, which, as the springs alternately compress and rebound, finds its way between the leaves, thus constantly lubricating them.

When the springs are efficiently lubricated it is obvious that the car is much more comfortable to ride in, the steering is easier, and all unnecessary strain is taken off the mechanism. With this device rusty and broken springs are a thing of the past, and the saving in wear and tear of tyres is very considerable.



The "Duco" spring gaiter can be supplied for any make of car, and there is no difficulty whatever in fitting them. They are hardly noticeable when attached, and when once fitted need not be removed, but simply filled up with grease through the lubricator every few months. The usual number required for a car is eight. As they are made to measure for each car, it is essential to order on a special measurement form, which gives the necessary measurements.

EXAMINERS FOR THE A.I.D.

There are still vacancies for examiners in the Aeronautical Inspection Department. The pay, including allowances, is £3 15s. rising to £4 5s., with prospects of further advancement.

Candidates should preferably be gentlemen with a good theoretical education, practical experience in engineering, and a working knowledge of scientific measuring instruments.

Preference will be given to those who are unlikely to be called up for military service, and who are not now usefully employed on war work.

Applications should be made to the Chief Inspector, Aeronautical Inspection Department, War Office, 13, Albemarle Street, London, W.

ADHESIVE GLUE FOR PROPELLERS

We learn that the Admiralty, after conducting the most exhaustive tests with every class of adhesives for the purpose of ascertaining the most suitable and reliable for the manufacture of naval aeroplane and seaplane propellers, have now "approved" "Croid" (extra strength quality). We believe contractors for propellers for War Office planes have been using this material for some time past. "Croid" in its standard strength quality is, we are aware, commonly employed by a large number of leading cabinet makers and others, on account of its being usable in a cold state as well as on account of its immense tenacity. The great strain to which propellers are subjected and the constant variation of temperature and atmospheric conditions

call for something beyond the powers of an ordinary glue, and the makers of "Croid"—the Improved Liquid Glues Co., Ltd., of Great Hermitage Street, London, E.—are to be congratulated on having produced an adhesive which has successfully passed the severe tests which the Admiralty especially have need to apply.

THE INSTITUTION OF MECHANICAL ENGINEERS—A general meeting of the Institution of Mechanical Engineers will be held at the Institution of Civil Engineers, Great George Street, Westminster, on Friday, April 14, 1916, at 6 p.m., when Walter Clemence, member, will read a paper on "Theory and Practice in the Filtration of Water."

"SHELL" IN THE ANTARCTIC—Shell motor spirit is being used in the motor sledges in connection with Sir Ernest Shackleton's Antarctic Expedition.

THE ASIATIC PETROLEUM CO., LTD.

Motorists and others are reminded that there has been no increase in the prices of "Shell" motor spirit. The current prices for England and Wales are: "Shell," 2s. 2d.; "Shell II," 2s. 1d.; and "Crown," 2s. per gallon (Scotland and Ireland one penny per gallon higher). There is no reason why anyone should be charged more. Every can is sent out properly sealed, and the seals should be intact when they reach the user. Those who are unable to obtain one-third of their usual supplies at the current prices should write to the Asiatic Petroleum Co., Ltd., St. Helen's Court, Great St. Helen's, London, E.C.

PATENT INFORMATION

This list is specially compiled for AERONAUTICS by Messrs. Rayner and Co., Registered Patent Agents, of 5, Chancery Lane, London, from whom all information relating to Patents, Designs, Trade Marks, etc., can be obtained gratuitously.

LATEST PATENT APPLICATIONS

- 4,261 G. Lambert. Aircraft. 22/3/16.
- 4,329 F. W. Lanchester. Airships. 23/3/16.
- 4,324 F. Lanchester. Floats for airships. 23/3/16.
- 4,303 J. K. Shanks. Aircraft. 23/3/16.

SPECIFICATIONS PUBLISHED THIS WEEK

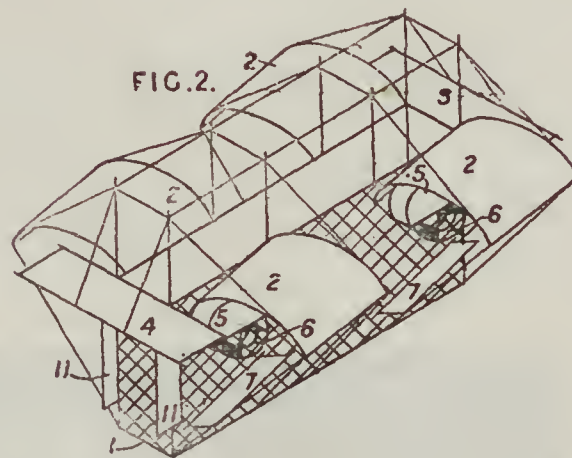
- 2,046 Greenwood. Flying machines.
- 10,887 Ringstrom. Aeroplanes.

SPECIFICATION ACCEPTED

- 10,660 Masters. Aeroplanes.

LATEST PUBLISHED ABSTRACT

- 22,578 "Aeronautics." A. D. Macropulos, 445, Hale End Road, Higham's Park, Essex. The aeroplane is provided with a series of wings or planes, 2, semi-circular in transverse cross-section and attached to the rectangular body, 1, at their inner ends. The body may be covered



with fabric to serve as a keel plane. The machine is propelled by paddle-wheels, 6, partly masked by casings, 5. The blades of the paddles may be fixed to the rotating frame, or may feather on the up-stroke. Screw propellers may be used in place of the paddle-wheels.

- 23,398 "Ammunition." J. Lutley, 78, King Street, Manchester. Relates to darts intended to be dropped from aircraft. According to this invention, instead of making the darts from bars of steel, etc., fluted at one end in a milling machine so as to provide axial ribs or vanes, the main body of each dart is made of a tube *a* of aluminum or other suitable material, within one end of which is secured to the shank *d* of a steel-pointed head *b*. The other end of the tube is crushed between three rollers so arranged as to produce vanes *f* which, as first formed, are parallel to the axis of the dart. The vanes may afterwards be twisted helically, as shown.

Printed copies of the published specifications and abstract can be obtained from Messrs. Rayner and Co., at the price of 1s.

AERONAUTICS

A WEEKLY JOURNAL DEVOTED TO THE TECHNIQUE OF AERONAUTICS

(FOUNDED 1907)

Edited by JOHN H. LEDEBOER, B.A., A.F.Ae.S.

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ONE PENNY

THE SOCIETY OF BRITISH AIRCRAFT CONSTRUCTORS

IN the turmoil of war, which on all hands has turned out so much less satisfactorily than could have been desired had England formed the best possible part of the best possible world, one is apt to lose one's sense of perspective. There is much truth in the old contention that only in the serene calm of the studio, removed by the lapse of long years and ancient enmities, can the historian pass a dispassionate judgment on current events, now distorted by the mental periscope of the individual mind, which cannot see straight for the obtrusion of the parapet of prejudices which limit its vision. Hence we are apt rather too much to be engrossed with the more blatantly bruited subjects of the moment to the detriment of our farther and more collective vision. To our eternal shame, to the wondering incredulity of other nations not gifted—let the word stand—with the same inconsequence, be it said that in this time of national stress we still hearken to the noise of the political praying-machine rather than face the stern facts of life and war.

Richard Burton, the second of that ilk, once recommended, as an infallible cure for despondency, a course of the larger mammals at the Zoological Gardens. I am at one with him, and in these distressful days, encompassed as we all are by the raucous hubbub at the hustings, I would fain go back to the ancient literary giants of old. For instance, there is old Edmund Burke, an Irishman and a sane, honest man to boot, and one who valued the truth of his convictions. From his "Reflections on the Revolution in France" I have culled the following passage, which appears to me to meet the present case. Quoth our amiable friend:

"Everything seems out of nature in this strange chaos of levity and ferocity, and of all sorts of crimes jumbled together with all sorts of follies. In viewing this monstrous tragi-comic scene, the most opposite passions necessarily succeed, and sometimes mix with each other in the mind; alternate contempt and indignation; alternate laughter and tears; alternate scorn and horror."

More might truly be said about this subject. Yet who but has not experienced this conflicting mood?

The strange thing is that in the hurly-burly of controversy the really essential phenomena pass unperceived, or, at all events, usually unrecorded; at best they are accorded the passing and fugitive mention by the truly conscientious chronicler. We all of us nowadays profess to have the fostering and encouragement of our aviation industry at heart, and have at last accorded it rank, if not of primogeniture, at least of essential national importance.

But if the outbreak of war, as the result of long years of official neglect and incompetence—even leaving aside wilful discouragement—found the aviation industry in a state of chaotic disorganisation through no fault of its own, the first years of war have rather tended to accentuate this lamentable condition of affairs. Short of the great armament manufacturers and the shipbuilders, the aviation industry to-day is that whereon our imperial existence relies more than on any other single factor; its importance, its continued prosperity, its choate and co-ordinate existence are

"More than mind discloses,
And more than men believe."

Yet in these last few days we have witnessed, or rather failed to note, the one supremely vital factor in the continued life of the aviation industry, a factor whose importance may well go unperceived in this present time of battle and bloody war, but will one day be truly recognised as the foundation-stone of our aerial salvation. Rhetoricians may spin their phrases in the musty precincts of Westminster, and the hustings may resound to the thunder of the politician's stamping; but meantime the aviation industry has been organising silently, and has at last achieved corporate existence. It is alive as it never was before; it is organising its continued vitality not only for the immediate exigencies of the war, but presciently is gazing ahead at far-off, better days.

Last week there was formed, without preliminary hulla-balloo, the Society of British Aircraft Constructors, as the first trade body truly representative of the interests of the British Aircraft Industry. The subjoined list of firms who have joined the Society and of their representatives on the first Council will speak for itself:

List of Companies and Firms who have Formally Notified their Intention of Joining the Society

Name of Company or Firm	Representative on First Council
Aircraft Manufacturing Co., Ltd.	Mr. G. Holt Thomas
Airships, Ltd.	Mr. G. Holt Thomas
The Austin Motor Co. (1914), Ltd.	Mr. Herbert Austin
William Beardmore and Co., Ltd.	Mr. C. G. Gourlay
The Blackburn Aeroplane and Motor Co., Ltd.	Mr. Robert Blackburn
Boulton and Paul, Ltd.	Mr. G. E. fiske
The Brush Electrical Engineering Co., Ltd.	Mr. B. Broadhurst
The British and Colonial Aeroplane Co., Ltd.	Mr. H. White Smith
The Coventry Ordnance Works, Ltd.	Lt.-Col. Mansell.
The Daimler Co., Ltd.	Mr. E. M. C. Instone
Darracq Motor Engineering Co., Ltd.	Mr. Robert Crossley
William Denny and Brothers	Sir Archibald Denny, Bt.
The Dudbridge Iron Works, Ltd.	Mr. Francis J. Platt

Name of Company or Firm	Representative on First Council
The Grahame-White Aviation Co., Ltd.	Mr. F. H. Payne
Hewlett and Blondeau, Ltd.	Mr. G. Blondeau
Jouques Aviation Works	Mr. L. A. Jouques
Mann and Grimmer	Mr. Grimmer
Martinsyde, Ltd.	Mr. Hamilton Fulton
Mann, Egerton and Co., Ltd.	Mr. G. N. C. Mann
D. Napier and Son, Ltd.	Mr. H. T. Vane
Handley Page, Ltd.	Mr. F. Handley Page
Phoenix Dynamo Manufacturing Co., Ltd.	Mr. P. J. Pybus
Parnall and Sons	Mr. George C. Parnall
A. V. Roe and Co., Ltd.	Mr. H. V. Roe
Robey and Co., Ltd.	Mr. Ashley P. Pope
Ruston Procter and Co., Ltd.	Mr. F. H. Livens
The Standard Motor Co., Ltd.	Mr. R. W. Maudslay
S. E. Saunders, Ltd.	Mr. S. E. Saunders
Short Bros.	Mr. E. B. Parker
The Sopwith Aviation Co., Ltd.	Mr. R. O. Cary
The Sunbeam Motor Car Co., Ltd.	Mr. L. Coatalen
The Siddeley-Deasy Motor Car Co., Ltd.	Mr. J. D. Siddeley
Fredk. Sage and Co., Ltd.	Mr. E. C. Gordon England
The Norman Thompson Flight Co., Ltd.	Mr. Norman A. Thompson
Vickers, Ltd.	Major H. F. Wood
Westland Aircraft Works	Mr. E. W. Petter
J. Samuel White and Co., Ltd.	Mr. Howard T. Wright
G. and J. Weir, Ltd.	Major J. G. Weir, R.F.C.
Wells Aviation Co., Ltd.	Mr. R. F. Wells
Whitehead Aircraft Co., Ltd.	Mr. J. A. Whitehead
Wolseley Motors, Ltd.	Mr. B. Caillard

* There is no need to enlarge upon the representative nature and of the high and world-wide standing of the firms concerned. Perhaps the most satisfactory feature in this connection, and one wherein this Society happily differs from

all other similar and abortive ventures is that it embodies representatives from every single branch of the aircraft industry, original aviation members as well as comparative new-comers. Follows the list of members of the first Committee of Management:

List of Committee of Management

Mr. H. White Smith (chairman of the Council), British and Colonial Aeroplane Co., Ltd.
 Major H. F. Wood, Vickers, Ltd.
 Mr. R. O. Cary, Sopwith Aviation Co., Ltd.
 Mr. G. Holt Thomas, Aircraft Manufacturing Co., Ltd.
 Mr. Howard T. Wright, J. Samuel White and Co., Ltd.
 Mr. H. V. Roe, A. V. Roe and Co., Ltd.
 Mr. E. B. Parker, Short Bros.
 Mr. L. Coatalen, Sunbeam Motor Car Co., Ltd.
 Mr. E. W. Petter, Westland Aircraft Works.

Here again we are on sure ground and certain. Let us emphasise this fact. By this incorporation of the British Aircraft Industry into one single homogeneous representative body, one possessing corporate existence and the faculty of self-expression, and yet remaining on the friendliest and most harmonious of terms with all existing institutions, the aerial salvation of the British Empire has been brought an appreciable step nearer, not only for the immediate present but for the future as well. Air committees may be formed, air programmes may be formulated, "all sorts of crimes may be jumbled together with all sorts of follies," yet the industry has now emerged from the period of tribulation and at long length has come into its own.

The Joint Air Committee

The newly-launched hybrid Joint Air Committee, designed to accomplish our aerial salvation by co-ordinating the supply of aircraft to the two branches of the Air Service, seems to be in a parlous state and likely to founder before long. The Earl of Derby, Chairman of the Committee, has tendered his resignation, and his example has been followed by Lord Montagu. The reason for these two resignations was long ago obvious, and has been foreshadowed in these columns. The Committee in question possessed neither executive nor administrative powers; it might advise, but could not enact. At the best it was a singularly ineffective compromise, and simply perpetuated the old state of affairs under a new name. Such are the reasons for the resignation of Lord Derby and Lord Montagu, the only two non-service members. The only remedy, and there is reason to believe that these are the views of both retiring members, is to form a Board of Aerial Control, constituted so far as the supply and production of aircraft are concerned on similar lines to the Ministry of Munitions. This step is likely to be taken ere long.

Meanwhile no further steps appear as yet to have been taken in regard to the Prime Minister's promised enquiry into the organisation of the air services generally, and Mr. Billing's allegations in particular. Is it too much to hope that the Government will at last handle the question sincerely and thoroughly, and handle it as a whole, and not in departmental chunks? Since the Air Committee has virtually vanished into space, surely there can be no more favourable opportunity than the present for a thorough reorganisation, root and branch, of the entire aerial administration and organisation, though everything, of course, depends upon the constitution of the Enquiry Committee, its terms of reference and its scope for free action. Should that happy consummation be attained, Lord Montagu's resignation, which really brought matters to a crisis, will have proved a blessing to the nation, while Mr. Billing's persistence will have earned its reward. Nevertheless, to him I would quote Edmund Burke once again: "You might, if you pleased . . . have given to your recovered freedom a correspondent dignity."

Our Squadrons in the Field

The following are brief extracts from a letter received from an officer of the Royal Flying Corps on active service:—

"I am blessed with the finest squadron in the field. We have been downing Huns right and left, and there is never a day without the squadron has at least a couple of scraps. . . . To my great content, I at last downed one myself, with the active assistance of —, on the 2nd. Unfortunately it crashed the wrong side, so have nothing to show for it. On the 3rd the squadron downed two, one on this side and one on the other. To-day is a dud flying day, so we are resting happily from our labours. But we have accounted for five Huns the last week, besides having many other scraps, so we have begun to think you people at home are protesting too much."

New Speed Records in France

In the *Journal M. Georges Prade* makes the following announcement:—On April 10 French aviation established new speed records. Needless to say, no exact figures can be published, so that we must perforce be content with stating that a new aeroplane, driven by a new engine, has beaten, on two occasions, all the previous world's speed records, not only for military machines, but also those set up in time of peace by machines which at that time did not appear to possess any military value. This implies that our pursuing aeroplanes ought now to establish a clear ascendancy, for all German speed records have been left far behind. Lastly, we would draw attention to the fact that the new record-breaking machine is one of those whose unjust exclusion from the aviation programme was commented on at the time, happily already far distant and well-nigh forgotten, of the aviation crisis.

A Vacancy for a Designer

A leading firm of aircraft manufacturers has a vacancy for a really first-class designer. The position is a very attractive one, provides great opportunity, and has a first-class salary attached to it. Applications sent to this office and marked "Aeroplane Designer" will be duly forwarded to the right quarter.

J. H. L.

NOTES ON THE DIMENSIONAL THEORY OF WIND TUNNEL EXPERIMENTS* †

By EDGAR BUCKINGHAM, United States Bureau of Standards

INTRODUCTION

THE forces which will act between a solid body and a fluid in contact with it in consequence of a relative motion of the two, cannot, except in a few of the simplest cases, be predicted by computation from the size and shape of the body, the relative velocity, and the physical properties of the fluid: the information can be obtained only from experiment. Such experiments may be expensive or impracticable, and it often appears desirable to get the required information, in advance of the final decision on the design of a structure which is to be subject to aerodynamic or hydrodynamic forces, by making preliminary experiments on a small model of the proposed structure.

In order that the results of such observations shall be interpretable as definite statements about the behavior of the full-sized original of which the model is a copy, certain requirements must be satisfied, and when they are satisfied the original and the geometrically similar model are said to be dynamically similar. The conditions for dynamical similarity are bound up with the general question of the possible forms of equations which describe relations subsisting among the physical quantities involved in physical phenomena.

NATURE OF THE PROBLEM TO BE DISCUSSED

Let us suppose that a solid body is moving, with the constant velocity S , through a fluid which is itself sensibly at rest at points far distant from the body; and let us consider the force exerted on the body by the surrounding fluid. Since these forces are evidently due to the relative motion, they would remain unchanged if the body were held at rest and the fluid made to flow past it with the velocity $(-S)$. The boundaries of the fluid are supposed to be so distant from the solid body that no sensible disturbance reaches them, and their nature can then have no influence on the forces with which we are concerned and need not be further referred to. If the fluid is a liquid with a free surface, the foregoing condition requires that the moving body be so deeply immersed as not to cause any surface disturbances.

Let R be any force exerted by the fluid on the body, for example, the component in any specified direction of the force on some particular part of the solid surface, or, to make it more definite, let R be the total head resistance in the direction of motion. Then R will depend on and be completely determined by the relative speed, the size, shape, and attitude of the body, and the mechanical properties of the fluid; and there must be a definite relation connecting these various physical quantities, which can be described by an equation. We wish to consider the nature of this equation in so far as it is fixed by the natures of the separate quantities involved in it.

THE PHYSICAL QUANTITIES WHICH INFLUENCE FLUID RESISTANCE

Let D be some linear dimension of the body, such as its greatest length. The shape of the body and its attitude—*i.e.*, its orientation with regard to the direction of motion can be specified by stating the ratios of a number of lengths to the particular length D . If these ratios are denoted by r' , r'' , r''' , . . . , etc., the size, shape, and attitude of the body are completely specified by the values of D , r' , r'' , . . . , etc.

The properties of the fluid which determine its mechanical behaviour are its density ρ , its viscosity μ , and its compressibility. Instead of the viscosity, it is generally more convenient to use the kinematic viscosity $\nu = \frac{\mu}{\rho}$ which will do equally well when ρ is given. And similarly, the speed C of sound waves in the fluid is fixed by the density and compressibility so that, conversely, C together with ρ fixes the compressibility. The properties of the fluid which concern us may therefore be specified by stating the values of the density ρ , the kinematic viscosity ν , and the acoustic speed C in the fluid.

We have now enumerated the quantities on which the force R may be supposed to depend, and if nothing has been overlooked there must be a complete relation connecting R with the other quantities. We may state the fact that such a relation subsists by writing the equation

$$f(R, S, D, r', r'', \dots, \rho, \nu, C) = 0, \quad (1)$$

and our first task is to obtain from general principles any information we can about the form of this unknown function f , which will enable us to restrict the amount of experimentation required to finish the work of finding the form of the equation.

APPLICATION OF THE PRINCIPLE OF DIMENSIONAL HOMOGENEITY

By the well known "principle of dimensional homogeneity," all the terms of a complete physical equation must have the same dimensions, and this fact enables us to simplify equation (1). Let it represent a dimensionless product of the form

$$\Pi = R^\alpha S^\beta D^\gamma \rho^\delta \nu^\epsilon C^\zeta, \quad (2)$$

the numerical exponents α , β , γ , etc., being such as to satisfy the dimensional equation

$$[R^\alpha S^\beta D^\gamma \rho^\delta \nu^\epsilon C^\zeta] = [1] \quad (3)$$

when the known dimensions of R , S , D , ρ , ν , and C are inserted. Then it may readily be shown † first, that since three fundamental units are needed as the basis of an absolute system for measuring the six kinds of quantity, R , S , D , ρ , ν , and C , the number of possible independent expressions of the form (2) is $6 - 3$ or 3; and second, that if these expressions are denoted by Π_1 , Π_2 , Π_3 , any correct equation involving the quantities which appear in equation (1) and no others, must necessarily, in order to have all its terms of the same dimensions, be reducible to the form

$$F(\Pi_1, \Pi_2, \Pi_3, r', r'', \dots) = 0 \quad (4)$$

In addition to the dimensionless ratios r' , r'' , etc., there now appear in the equation only three instead of the original six variables, so that the labour of determining by experiment the form of the unknown function is much less than if we had to deal with all six variables.

THE MORE SPECIFIC FORM OF THE EQUATION OF FLUID RESISTANCE

The dimensions of the quantities on the familiar mass, length, time, or $[m, l, t]$ system are:

$$\begin{aligned} [R] &= [mlt^{-2}], & [\rho] &= [ml^{-3}], \\ [S] &= [lt^{-1}], & [\nu] &= [l^2t^{-1}], \\ [D] &= [l], & [C] &= [lt^{-1}]; \end{aligned}$$

* "Reports on Wind Tunnel Experiments in Aerodynamics," Smithsonian Collection. The first article appeared in AERONAUTICS, March 8.

† *Physical Review* (2), 4, p. 345, October, 1914.

and we see by inspection that the expressions

$$\Pi_1 = \frac{R}{\rho D^2 S^2}, \quad \Pi_2 = \frac{DS}{\nu}, \quad \Pi_3 = \frac{S}{C}$$

are dimensionless products of the required form (2), and that they are independent. Accordingly, we know that equation (1) must be reducible to the form

$$F\left(\frac{R}{\rho D^2 S^2}, \frac{DS}{\nu}, \frac{S}{C}, r', r'', \dots\right) = 0 \quad (5)$$

This equation is fundamental to the experimental study of the hydrodynamic or aerodynamic forces acting on totally immersed bodies.

Solving for Π_1 we now have

$$\frac{R}{\rho D^2 S^2} = \phi\left(\frac{DS}{\nu}, \frac{S}{C}, r', r'', \dots\right), \quad (6)$$

in which the form of the unknown function ϕ remains to be found, if it needs to be found at all, by experiment or by other than dimensional reasoning.

SIMPLIFICATION WHEN COMPRESSIBILITY MAY BE DISREGARDED

A simplification is possible when the motion is not rapid enough to cause any sensible compression in the fluid. In this event it is immaterial what the compressibility is, so that $\frac{S}{C}$ may be omitted from consideration and equation (6) reduces to

$$\frac{R}{\rho D^2 S^2} = \phi\left(\frac{DS}{\nu}, r', r'', \dots\right). \quad (7)$$

The approximation attainable when compressibility is thus left out of account depends on the value of $\frac{S}{C}$. If $\frac{S}{C}$ is a small fraction, as it nearly always is with liquids, equation (7) is a satisfactory substitute for (6). The speed of sound in air under ordinary conditions is of the order of 1,100 feet per second, or 750 miles per hour. For rifled projectiles $\frac{S}{C}$ may be as high as 2.5 or even 3, so that equation (7) would be entirely misleading if used in studying projectile resistances. But at the speeds which occur in aeronautics, with the exception of propeller tip speeds, the ratio $\frac{S}{C}$ is a sufficiently small fraction that the air acts nearly like an incompressible fluid—*i.e.*, like a liquid of the same density and viscosity; and equation (7) may be used as a sufficiently approximate substitute for the more general equation (6).

Equation (7) supplies the basis for the experimental investigation of the aerodynamic problems which occur in connection with aeronautics and aviation by means of reduced scale methods.

RESTRICTION TO GEOMETRICALLY SIMILAR BODIES

Let us now confine our attention to a series of bodies of various sizes, but all of the same shape, and presented to the wind in the same attitude. The bodies are geometrically similar, and any one may be regarded as a reduced or enlarged model of any other. The ratios r', r'', \dots are now constants, so that equation (7) assumes the simpler form

$$\frac{R}{\rho D^2 S^2} = \psi\left(\frac{DS}{\nu}\right), \quad (8)$$

in which the form of the unknown function ψ of the single argument $\frac{DS}{\nu}$ remains to be determined by experimenting on bodies of the given series. The nature of this function

will depend on the shape and attitude of the bodies but not on their size, if our disregard of compressibility, leading from (6) to (7), was a justifiable approximation.

The obvious procedure, in investigating ψ by analysing the results of experiments, is to plot observed values of $\frac{R}{\rho D^2 S^2}$ against values of $\frac{DS}{\nu}$ and draw a curve through the points thus obtained. If we are using air of constant density and viscosity the experiments may consist mostly simply in measuring, by the aerodynamic balance, the force R exerted on a given body at various values of the wind speed S . Variations of $\frac{DS}{\nu}$ may equally well be produced by varying D while S is constant—*i.e.*, by experimenting at a fixed speed but with a series of models of different sizes; or, D , S , ρ , and ν may all be varied simultaneously. But while such experiments furnish a desirable check on the results obtained when S alone is varied, they are not necessary, if compressibility is negligible; for it is immaterial whether $\frac{DS}{\nu}$ is changed by changing D , S , or ν .

If the plotted points obtained in any of these ways do not all lie on a single curve, within their experimental errors, equation (8) is not accurate enough. And if the models have been exactly geometrically similar, we must conclude that compressibility has played some part in the phenomenon. This means that in the more general equation

$$\frac{R}{\rho D^2 S^2} = \phi\left(\frac{DS}{\nu}, \frac{S}{C}\right) \quad (9)$$

obtained by applying (6) to geometrically similar bodies, the effects of varying $\frac{S}{C}$ are not of entirely negligible importance.

HEAD RESISTANCE PROPORTIONAL TO S^2 ; VISCOSITY NEGLIGIBLE

At ordinary speeds and for bodies that are not too small, experiment shows that in air of standard density, R is very nearly proportional to S^2 . It follows that, to the degree of approximation to which equation (8) is valid, $\psi\left(\frac{DS}{\nu}\right)$ is merely a constant and is independent of the values of D , S , and ν . If we write

$$\psi\left(\frac{DS}{\nu}\right) = K,$$

equation (8) reduces to

$$R = K \rho D^2 S^2 \quad (10)$$

As is seen by referring to equation (7), K depends on the values of r', r'', \dots , etc., it is a shape factor for the given series of geometrically similar bodies in the given attitude.

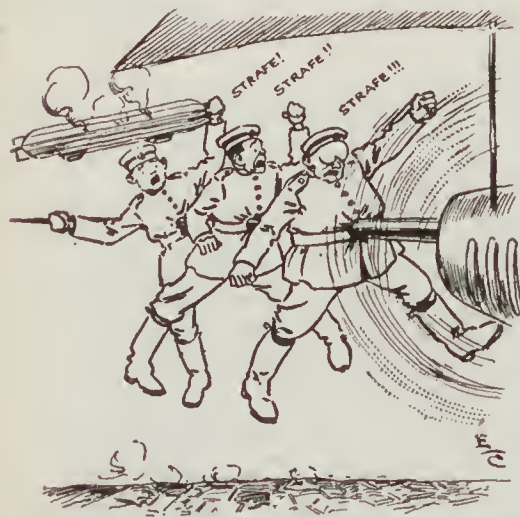
It is to be noted that viscosity does not appear at all in equation (10), so that when the resistance is found to be proportional to the square of the speed, if compressibility is negligible the value of the viscosity is of no importance. This is not equivalent to saying that viscosity plays no part at all in the phenomena; for if viscosity did not exist there would be no eddies of finite size, no dissipation, and at a constant speed no resistance. It means, rather, that the drag on the body by the fluid is due to the continual drain of energy needed to set up anew the turbulent eddying motion about the body; and that when these eddies have once been created it makes no difference how fast they are dissipated by viscosity after the body has left them behind.

(To be continued)

RANDOM REMARKS

XLIV.—THE JOURNEY'S END By ARTHUR LAWRENCE

IT was not long before "Ruggy" had discovered a means for shortening the sight of his Telo-Micro. It was with the naked optic, however, that he sighted a Zeppelin. "Where away?" I exclaimed. "On the port bow," came the reply. Without much ado I ran out my three-hundred-yard patent oxtuple steel rammer, at the same time veering the Pterodactyl straight for my objective, and coupling-up the rest of my engines. Our speed now registered 200 miles, about twenty miles more than the Ptero. had done on her trials, whilst by the use of the theodolite I perceived that the Zeppelin was well under the hundred. Her rear gun



"UNPLEASANT ODDMENTS ON
OUR STEEL RAMMER"

spattered a string of bullets upon us, but they struck my bullet-proof double protector at an acute angle of incidence. Only once did the Zepp. manage to soar above me, and the fellow at the machine-gun was so energetic that the bullets rained on the Ptero's top-knot. I canted up, and the rammer went straight through her

vitals. Ruggy spent the next few minutes with our telescopic mop pushing unpleasant oddments off our steel rammer.

"Rather a messy job that," I remarked. "If we should run into one of those rotters again, knock them out with our 17.5." Ruggy gave me the salute of Zenobia. After which we shared a tumbler of peppermint, the Liquor Control Board having prevented us from carrying anything stronger than imitation *crème-de-menthe*. It was at this moment that, to our utter astonishment, a heavy form emerged from amongst our explosives. It was none other than our sportive artist. He was in a belligerent mood. "Thought you were going to leave me behind?" "Cheeryo!" I replied, determined to make the best of the circumstance, whilst Ruggy deftly removed a bottle from the artist's back pocket and threw it overboard, dropping it a couple of miles out of temptation. It was a long time before those pugilistic features relaxed; but he is not a bad fellow, and this joy ride for nothing was evidently affording him much childish pleasure. Appropriately enough, he carried with him a mass of thick cartridge paper and was soon busy plying his pencil and brush.

By the time I had come over the German lines my observer had made two discoveries. One was that the Crown Prince had been shot in the back, and the other that the Reverend Kaiser had resorted to a subterranean cavern some thousand feet deep. He had been well informed of my coming. Apart from those circumstances, my notion of destroying these monsters had been abandoned, because, at the last moment, I had perfected a method of wholesale and painless

death. I sympathised with the poor German soldiers. However awful their cause, and no matter how ghastly the expedients adopted, they were mostly actuated by the idea of doing their duty. Yet, little as some of us may seem to believe it, we must all pass away at some time or another, and in this case the enemy, without pain, would simply cease to exist on this earth, and would therefore be much better off than civilians who die of cancer or some other terrible trouble. Their own primitive efforts at asphyxiation had supplied me with the fundamental idea. Even now I had better not go into details. I will simply give the key to the solution:— $2qed\ 3xyz\ 9iky - df + \frac{3}{4} ex \frac{337}{488}$. Those who have read the AERONAUTICS editorials for the last seven years will have little difficulty in working out this formula to its logical conclusion. Obviously the danger confronted one of destroying the British and French armies as well; but, subject to certain conditions, I felt confident that I could control the sphere of influence. I did. The 41st Brandenburgers, the Strafe-You Hussars, the 1st to the 45th Limburgers, among other first-class German regiments, were completely



"THE CROWN PRINCE HAD
BEEN SHOT IN THE BACK"

wiped out. There were the trenches, the big guns and the batteries, but on a front of 280 miles no German breathed. The war was at an end. I do not accuse the French or my countrymen of anything approaching stupidity, but we had to cruise along the whole front and exhort to the utmost before we could convince our friends that the road was clear to Berlin. Many days occurred before the German population and others could believe what had happened. It was left to Sir Edward Carson and Lord Morley to dictate severe terms in Berlin. For myself, I declined to be interviewed, and resumed the working out of an extremely interesting chess problem in my back attic.

ENGINEER AND FOKKER

British Headquarters, France, April 9—A strapping soldier suddenly came upon the scene of the landing. He beheld an aeroplane which was clearly not of British pattern, and a well-swathed figure standing by it. Having dismounted, he went up to the Boche with his hand extended and a genial smile. The German shook silently and sadly. The well-meaning Tommy then began to flounder into pigeon-French. The Boche murmured and slowly wagged his head. It was just at this juncture a party of Fusiliers came around a bend of the road. Taking in the situation—a black cross aeroplane on the ground and what was evidently one of its occupants trying to get the engine to work again—they came on at the double, unslinging their rifles as they came. The Fusiliers, concluding that the engineer was a Boche trying to make away with papers or photographs, paused and let fly. Happily the aim was too hurried to be good. The soldier took a flying leap into the roadside ditch and there awaited capture. When he learned that he had missed the chance of making this fine capture himself single-handed I am told his language was quite unrepeatable.

PROGRESS OF AMERICAN AVIATION

By ERNEST L. JONES, American Editor

THE L.W.F. ENGINEERING CO.

CHARLES F. WILLARD and Robert G. Fowler, together with Edward G. Lowe, Jun., of San Francisco, have been quietly preparing an aeroplane factory which no one can jest at. With all the secrecy that open operations provide they have gone and taken a couple of floors in a Long Island City industrial plant, and have under way all sorts of practical plans.

Lowe is unknown to aeronautical fame, it is readily admitted. Charles F. Willard, however, is a horse of another colour. Willard, it will be remembered without great effort, was the first man in the world to go on tour with a flying machine. The machine was the first Curtiss aeroplane ever built, and that at the order of the Aeronautical Society. Willard has from 1908 been known as a pioneer in aviation, in the real flying end of it. Willard is an engineer to begin with; he is a flyer in the second place; now, in the third place, he branches out as a dyed-in-the-wool

It may be expected that the machines produced will be samples of real engineering. Mr. Willard has had the honour of designing the largest flying boats the world has ever seen to date—machines which will have four motors of 1,000 horse-power total, and will weigh, with petrol for eight hours, some 15,500 lb. He has now entered the aeroplane business on his own account, and the developments may be watched with especial interest

L.W.F. ENGINEERING COMPANY

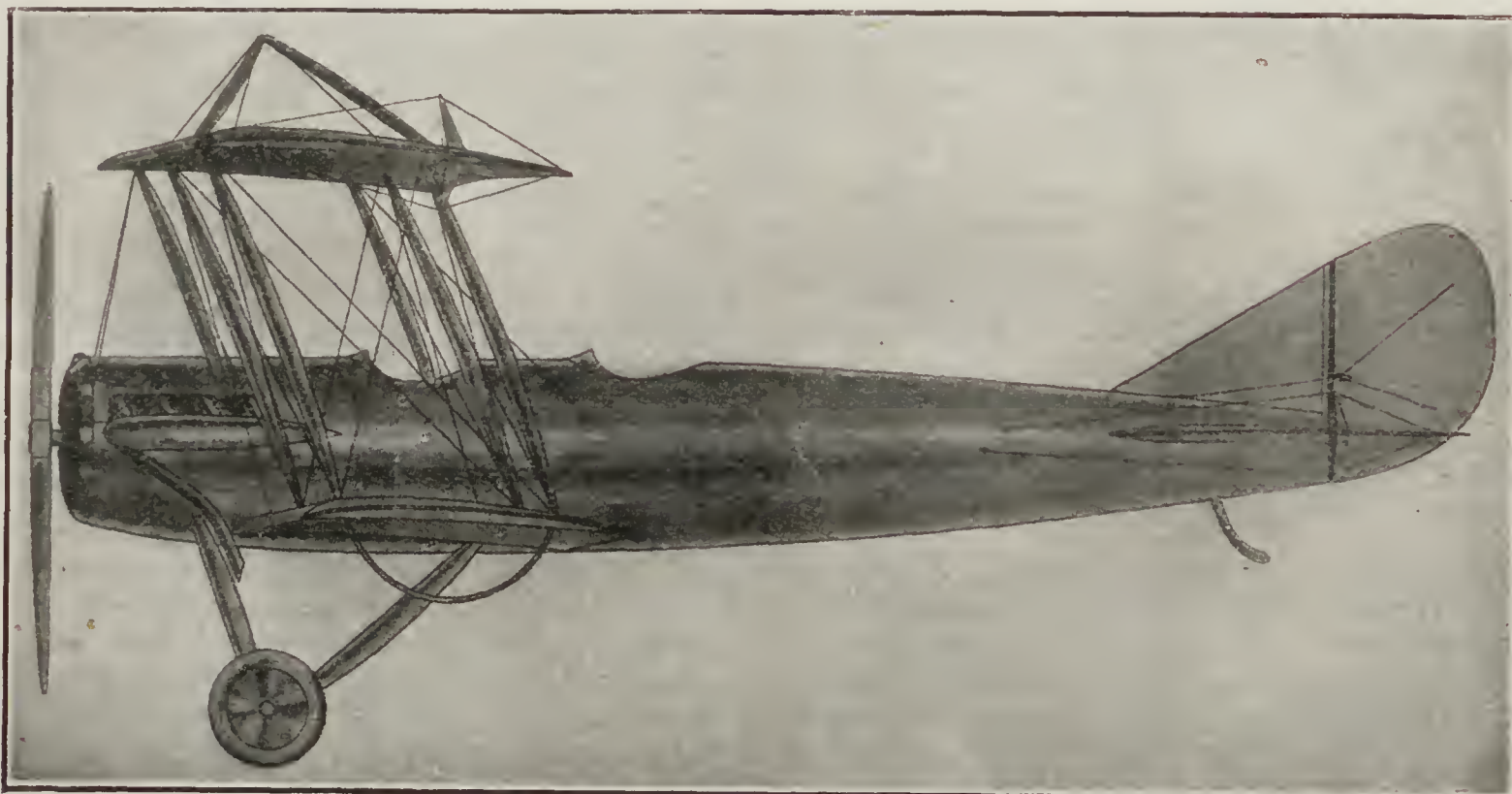
SPECIFICATIONS. MODEL V TWO-PASSENGER TRACTOR BIPLANE

Motor—This model is equipped with a 140 h.p. eight-cylinder V. Sturtevant motor. (Any other make adopted if so desired.)

Surface—490 square feet.

Spread—Upper surface, 46.5; lower surface, 38.6.

Factor of Safety—A factor of safety of seven and one-half



SIDE VIEW OF L.W.F. MODEL V TRACTOR

manufacturer. Robert G. Fowler is the man who flew from Los Angeles to the Atlantic coast in one of the old Model B Wrights, and if anyone knows what cross-country flying is, it is "Bob" Fowler. Beside his achievements the cross-country hops of the latter-day fliers look like the efforts of children with a toy.

The location of this new plant is at 67-79, Sixth Street, Long Island City, N.Y., and is operated in conjunction with a plant in California. The New York factory will be run at least during our present well-known war.

Three types of machines are offered for the kind consideration of the public, which is more or less rushing to buy aeroplanes. All three of these are combined land-and-water types, that is, they can start from and alight on either land or water. One type is a tractor, along standard lines, but designed with an eye to engineering effectiveness; the second appeals to the sportsman who wants speed and efficiency and real comfort, and this will, naturally, be a pusher. The third type is a very large machine, built purely on military lines. It will run up to a weight of 7,500 lb., and will be driven by two new twelve-cylinder engines.

minimum has been maintained throughout this machine, with greater allowance on vital parts.

Body—Fuselage—The body construction is a special feature on this machine. Three plies of extra selected wood are used, and between each ply is a layer of silk, which has been chemically treated, so that when the cement is applied the laminations are thoroughly bound together.

One ply of wood runs longitudinally, while, of the other two, one is spiralled to the right and the other to the left.

This whole shell is then covered with a specially prepared fabric. In the case of water machines (hydro-aeroplanes), the body is stitched through and through with fine extra strong wire, which eliminates any possibility of separating the different plies from exposure. The body is carefully treated with several coats of waterproof preparation, and over this from two to four coats of spar varnish. This form of body construction is the strongest, safest, and lightest known to day, and was adopted after a careful consideration of aluminium, steel, and alloys worked up in the various forms.

The special attention is called here to the fact that the pilots are free from any possible damage from long

splinters in the event of a bad landing, as the silk and spiral construction tends to eliminate such fractures. If a forced landing should be necessary in trees or shrubs, from experience we believe that no serious injury would befall the pilot or passengers, as the danger of being pierced by small limbs would be entirely eliminated by the wooden body.

Two comfortably upholstered seats, arranged in tandem, are provided in this body.

Control—Farman or any standard type, such as "Dep.," shoulder control, or L-W-F 3 in 1, will be furnished on request.

Landing Gear—Chassis—The landing gear of this machine is purely of military design, such as has been adopted by the United States and foreign Governments, and consists of two 26 by 4 pneumatic-tired stream-lined wheels mounted on a nickelled steel tubular axle, which latter is attached to the chassis by a series of elastic bands of conventional design.

We are preparing, in addition, a three-wheeled landing

All our pontoons are constructed of mahogany or cedar planks, with spruce braces and hard-wood steam-bent ribs.

Fastenings are of non-rusting or non-corrosive material.

The planks are screwed to the ribs.

Wings—The most efficient form of standard wing section has been adopted for this machine, and this surface is so arranged as to give the greatest possible inherent stability to the machine without sacrificing an unreasonable amount of flying capacity.

The leading edge of the wing is covered with two-ply wood on the top side as far back as the front beam in order to maintain the correct curve. The beams are of careful design, and have been calculated in accordance with the regular practice of this company and good standard engineering.

Wing Fittings—All metal fittings used on the wings, or throughout the machine, in fact, have been carefully designed with a view to give absolute safety and durability.

Turnbuckles—Turnbuckles are proportioned after the R.A.F. specifications, are similar in design, and far above



PLAN SKETCH OF L.W.F. TRACTOR

gear, which is especially designed for sportsmen or instruction purposes, with a view of preventing machines from "nosing over" in landing and giving a maximum of safety.

A swivelled tail skid of our own design is mounted just in front of the rudder, but free from it. The upper end of the skid, as well as the customary elastic shock-absorbing devices, are housed in the body of the machine, thereby decreasing the head resistance and improving the appearance of the machine.

Floats or Pontoons—This machine is so designed that a complete water gear may be put on in place of the wheels, etc., in a very short time.

This water gear consists of two main floats of our own type, and very-carefully designed to take care of alighting on rough water, quick rising, and to prevent diving in starting.

A balanced pontoon is placed under the rear of the machine to prevent the same from turning over backwards while on the water.

the ordinary stock makes in both strength and appearance.

Wire Fastenings—Cone socket wire terminals have been introduced, as this is the only fastening that allows the development of the full capacity of the wire. These parts have been proportioned on careful calculation and on actual test of over one hundred specimens.

Contrary to common belief, extra skill is not necessary to make a secure job with this fastening; in fact, it is less necessary than with other types now in use.

A small link has been placed between the strut bearing plate and the wire terminal or turnbuckles to facilitate in the packing and to eliminate any tendency towards crystallisation from vibration while in flight. Each and every turnbuckle, wire, and terminal is tested to the full factor of safety requirement before being used.

Cloth—The fabric used varies upon the conditions for which the machines are designed. In this case a specially strong fabric, complying with the strength requirements of R.A.F. specifications, is used.

The seams are double lapped and sewed with silk, while

the cloth is placed on diagonally and sewed to the ribs in such a manner that the top and bottom cloth coverings are joined.

This system of sewing has only been in vogue, in this country at least, for a very short time, and, while more expensive to the contractor, is somewhat superior to the previous system of using tacks, especially on the top side.

Fuel Supply—A fuel supply for five hours is regularly provided in three tanks made of the best dairy tin, riveted with copper rivets and soldered.

Larger or smaller tanks will be furnished without extra charge, provided no special design is called for.

Stabiliser—The stabiliser is divided and mounted on either side of the body.

In design it is of the non-lifting double-cambered type.

These pieces, together with the elevators, are quickly detachable from the body.

Propeller—One Paragon propeller, designed especially for our machine and the motor therein, is furnished with each complete machine.

Rudder—The rudder frame is steel tubing, and mounted in the conventional way at the rear of the body.

Mufflers—Exhaust gases are piped away from the motor and discharged beneath the planes, thereby adding greatly to the comfort of the occupants.

Equipment—Our regular dashboard equipment consists

HYDROAEROPLANES AS VESSELS

Inquiry has been made by the Collector of Customs at Boston as to the right to free entry of compasses to be used on aeroplanes of the United States Navy. The Treasury Department advised as follows:—

"The Treasury Department is of the opinion that hydroaeroplanes constitute 'vessels' within the meaning of that term as used in sub-sections 5 and 6 of paragraph J of section 4 of the Tariff Act of October 3, 1913, and that compasses for hydroaeroplanes constitute articles of outfit and equipment, and are entitled to free entry as such, subject to compliance with the regulations in T. D. 34150.

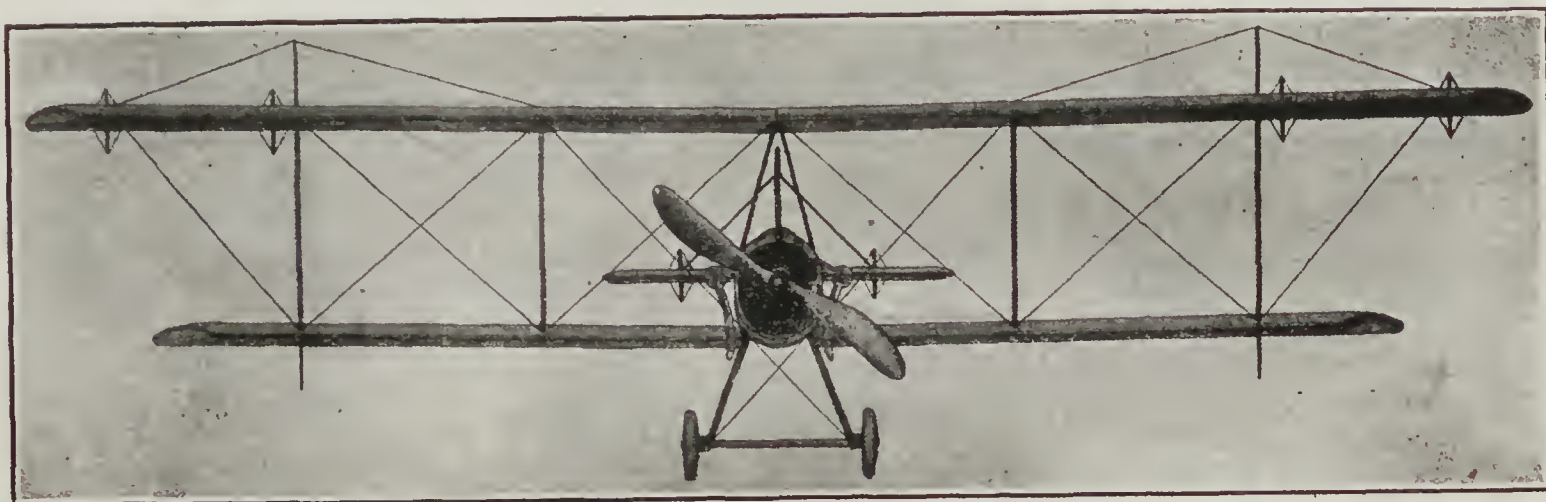
"Aeroplanes other than hydroaeroplanes are not deemed to be 'vessels' within the meaning of the said provisions of law."

NEW SEAPLANE HEIGHT RECORD

Lieutenant R. C. Sausley on March 9 at the U.S. Navy Aeronautic Station at Pensacola, Florida, established a new hydroaeroplane altitude record with Navy machine "AH-13," by climbing 12,400 feet in 74 minutes. The machine he used was a Curtiss pusher type hydroaeroplane, equipped with Curtiss Model OXX motor developing 90 horse-power. This breaks all previous hydroaeroplane records for rate of climb per horse-power used.

NEW BOOKS

"FEAR GOD AND TAKE YOUR OWN PART" By Theodore Roosevelt. 414 pp., cloth. Published at \$1.50 by Geo. H. Doran Co., 38, W. 32 Street, New York. Here is a book that will appeal to every red-blooded man of any country who believes in a prepared-for peace with honour. Speaking of aeronautics, he says: "We need an immense development of the Aviation



FRONT VIEW OF L.W.F. TRACTOR BIPLANE

of an altitude meter, which reads to 10,000 feet; a motor speed indicator; rolling and pitching gauges; oil and air pressure gauges when the motor installed requires the same.

A speed indicator which tells the speed through the air will be furnished at cost.

Special military or sporting appliances will be installed at the customer's request, no charge being made for installation when the appliances are furnished by the customer.

Guarantee—We guarantee all parts both as to design and material which are supplied by this company to be the very best that can be obtained, and we will only build such a number of machines as will allow for the delivery of each one in perfect condition.

Price—As each customer has special requirements, it is not practical to make a definite and final price in advance of this information.

The approximate price of this machine, complete with packing boxes f.o.b. our works, is \$10,500.00. A discount will be allowed where only one type of landing gear is furnished or other equipment omitted.

Notice—While the machine described herein is a stock machine, special attention is called to the fact that we are qualified and ready to design and build special machines for any practical purpose, and with any assurance of being able to dispose of any particular type of machine we will design and build the same to the customer's specifications or requirements.

Corps. I wonder how many of our people understand that at this time the total strength of the officers and men in the French Aviation Corps surpass in number the total strength of the officers and enlisted men in the U.S. Army."

"INVENTIONS AND PATENTS" By Philip E. Edelman. 8vo, cloth, 288 pp. Published at \$1.50 by D. Van Nostrand Co., 25, Park Place, New York. The author makes plain patent procedure and illuminates the little understood patent system. A practical handbook for the inventor.

Chapters include The Development of the Patent System, The Patent Office, Patent Attorneys, The Germs of Invention, Fields of Invention, Preliminary Steps to Secure a Patent, Patentability and Practicability, Application for and Prosecution of a Patent, Protecting an Invention, Points of Patent Procedure, Patent Rights and How they are Utilised, Disposing of Patent Rights, About Infringements, Foreign Patents, etc.

The Appendix answers many questions which come to mind by citing court decisions on every conceivable situation.

NOTICE TO OUR READERS

Owing to the Easter holidays, next week's issue of AERONAUTICS, which would ordinarily have appeared on Wednesday, April 26, will instead be published on Thursday, April 27. In view of the shortage of paper, our readers are earnestly requested to order their copies beforehand from their newsagent or bookseller, or, alternatively, to have their copies sent direct from this office at our usual subscription rates—6s. 6d. per annum post free.

ELECTRICALLY-WARMED GLOVES FOR AVIATORS

THE extreme discomfort experienced by aviators when flying at any considerable altitude as a result of numbed and aching hands has never been thoroughly remedied by any gloves or other appliance offered for sale as an accessory.

For some time this difficulty has engaged the attention of practical men, with the result that two devices have been perfected which thoroughly accomplish the end in view, and which are yet of negligible weight.

The first consists of electrically-heated gloves, the essential features of which are the use of an electric heating element distributed throughout the fingers and back of both hands, which, when connected to a light, fan-driven generator, gives uniform heating all over the hand, and the use of a

metal plates, thus completing the electric circuit through each glove. The electric contact between the buttons on the gloves and the plates on the wheel will not vary appreciably under normal conditions of use. The pressure would have to be much lighter than that necessary to manipulate the wheel before the current would be interrupted.

The amount of heat required will depend upon the temperature, wind, and speed of the machine, and the temperature is easily regulated by breaking contact with the forefinger. No over-heating will be experienced, as the heat becomes constant after a few minutes' contact.

An electrical test which was conducted in an independent laboratory showed a rise in temperature of 40 degrees above

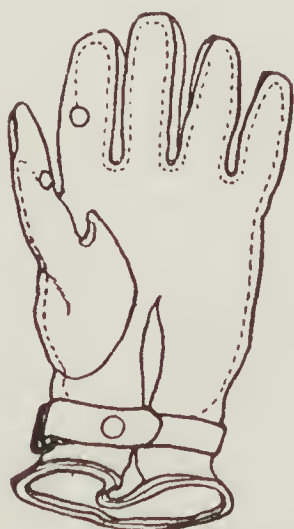


FIG 1

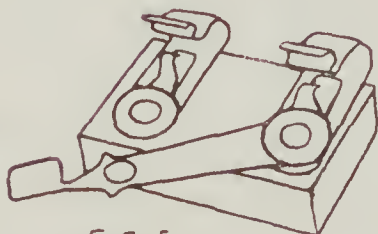
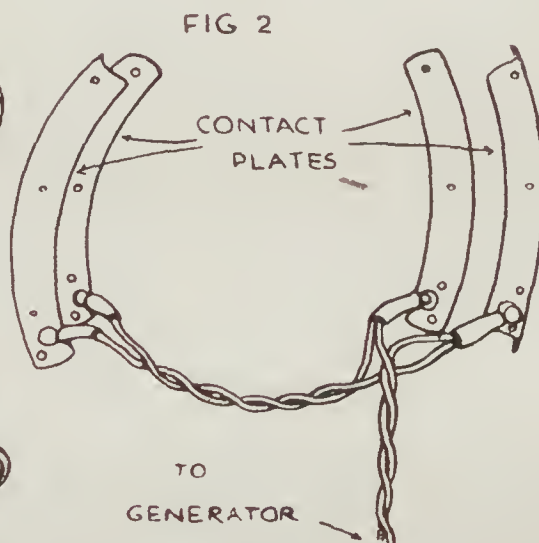
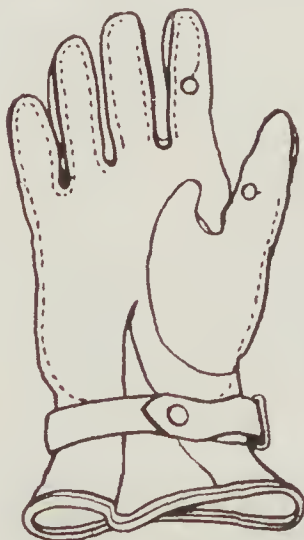


FIG 5



FIG 4

A LEATHER GLOVE
B WOOLLEN LINING
C STRANDED FLEXIBLE WIRE

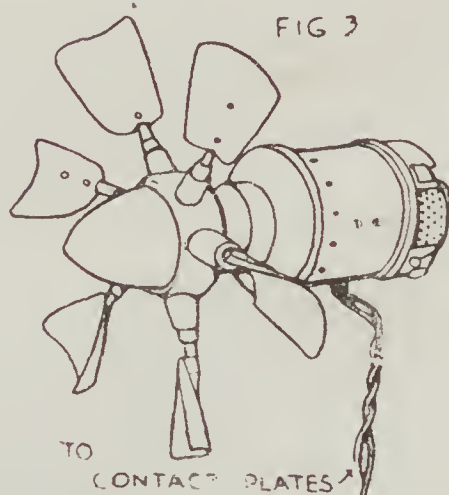


FIG 3

contact arrangement on the wheel, so that there are no cords attached to the gloves to interfere with the free use of the hands.

Inside the heavy leather gloves is sewn a woollen glove or lining, through which is laced the flexible wire which carries the electric current. This wire is threaded into each finger and over the back of the hand, and is arranged and covered in such a manner that it does not come in contact with the hand at any point. The wire terminates at two small brass discs which are attached to the outside of the leather glove, one on the inside of the thumb and the other on the forefinger opposite to the one on the thumb.

A pair of contact plates cut from thin non-corrosive metal are attached to the wheel. These are shaped to fit the segment perfectly, and abrasion of the gloves or the rim of the wheel is impossible. A neat switch is provided, and the current can be shut off when heat is not required. No amount of saturation will short-circuit the current, and the whole appliance will last for years. The grip obtained is better than that when mittens are used, as the fingers can be freely moved.

When the wheel is grasped, the contacts on the thumb and finger of the glove automatically come in contact with the

a surrounding air temperature of 70 degrees, and a rise of 61 degrees in twelve minutes. These results were obtained with a pair of gloves which had already been in use two seasons. One glove was soaked in water before being tested, but the water had no noticeable effect.

It may be interesting to note that the heating element which is woven into the gloves is composed of sixty-three fine strands of a non-rusting alloy, and is so flexible that it cannot be detected when the glove is on the hand. Nevertheless, it has a tensile strength of 100 pounds. One user says, "I have not yet had my hands or fingers the least bit cold, and it is one of the best safeguards I know of for preventing an accident, because you do not have to take your hands from the wheel to beat the numbness out of them."

The other device to which reference has been made consists of two neat leather-covered grips, one for each hand, which lace on to the wheel at any position convenient. Resistance wires are arranged cunningly between two copper plates in such a way that a very small current is sufficient to keep the grips warm.

Both these styles of heating apparatus are being marketed in this country by Mr. Lyman J. Seely, of 17, Surrey Street, Strand, to whom enquiries should be addressed.

STATEMENTS IN PARLIAMENT

HOUSE OF COMMONS

April 11—*Schools of Aviation*—Mr. Tennant, in answer to Mr. Pemberton Billing (Ind., Herts, E.), stated that principals and instructors of civilian schools of aviation would be called up under the Military Service Act, and where possible placed in the Royal Flying Corps, if unmarried and not attested, unless they had received certificates of exemption or had applied for exemption to a local tribunal.

The Joint Air Committee—Mr. Tennant (Berwickshire), replying to Mr. Billing, said: There are, of course, differences of opinion, but no friction whatever exists between members of the Joint Air Committee. I understand two members have resigned.

The Army Council—Mr. Billing asked the Under-Secretary of State for War whether, on the occasion of last Sunday's raid, a Zeppelin passed on two occasions within easy range of an anti-aircraft gun stationed in an eastern county; if so, why was the gun not fired; why was no official warning given to the officer in command; and whether an officer was left without any discretion as to when he should fire.

Mr. Tennant: The Army Council are addressing to the hon. member a letter inviting him to furnish particulars of the time and place at which the incidents mentioned are believed to have occurred.

Ministers and Air Policy—Mr. Asquith, replying to Mr. Brookes, who asked whether the Cabinet had considered the future air policy of the country as a whole, apart from the requirements of either the Army or the Navy; and, if so, what decision had been arrived at, said: I cannot agree with my hon. friend that it is possible to consider this problem "apart from the requirements of the Army and Navy." His Majesty's Government give, as is their duty, constant attention to this as to all other problems arising out of the war.

The Joint Air Committee—On the motion for the adjournment of the House, Mr. Billing called attention to the resignations of Lord Derby and Lord Montagu from the Joint Air Committee, and pressed for information as to the real significance of the action of those noble lords. He complained that the Government, instead of appointing a board with powers to deal with the aircraft menace, appointed a committee who, he understood, had no powers whatever. What they did was to answer public clamour by offering the name of Lord Derby. It was expected that there would be complete and satisfactory inquiry, but this did not take place, and when Lord Montagu in the House of Lords took upon himself to criticise the Air Service he also was asked to join the Committee. What was the Prime Minister going to do now? Would he offer another name to the public as a means of further postponing inquiry and action? When they considered the indignity to which the country had been subject by the air raids and the actual injury done, they must surely recognise that something more should be done than the throwing of names to the public. He went on to ridicule the so-called protection which he said had been given to some places by the provision of wooden guns, and asked whether the Government really believed that the German spy system was so defective that such provision was not certain to be futile. He would again ask the Prime Minister to stop this fooling, to abolish the committee, and appoint in its place a board with powers to inquire into all the allegations made against the Air Service, and to take effective action. A question had arisen a few days ago as to his being asked to organise and lead a service directed against enemy aircraft. He had heard nothing further since. If the Prime Minister would not at once appoint the board that was asked for he must appeal to him to give a day before the Easter recess for a full discussion of the whole question.

Mr. W. Rea (L., Scarborough), who was the only occupant of the Treasury Bench, said that so far as he was able to ascertain no notice had been given to any of the usual representatives of the Government that this question would be raised. In the circumstances, he regretted that it was not possible to offer the hon. member a reply.

April 13—*German Airship Prisoners*—Mr. Tennant (L., Berwickshire) informed Mr. Billing (Ind., E. Herts) that the captured officers and crew of the Zeppelin which foundered in the Thames Estuary were regarded and treated precisely as other prisoners of war.

Enemy Property and Air Raid Damage—The Chancellor of the Exchequer, in reply to Mr. Butcher (U., Yorks), said the approximate estimate of the value of property belonging to enemies or enemy subjects which had been vested in or received by the custodian was as follows: England and Wales, £8,122,000; Scotland, £584,000; Ireland, £38,000. He was unable to adopt Mr. Butcher's suggestion that all damage caused in this country by hostile air raids should be made good out of this property.

Firing of Anti-aircraft Guns—Mr. Tennant, replying to an inquiry by Mr. Billing (Ind., E. Herts) whether, in view of the conflict of opinion as to the duties and responsibilities of officers commanding anti-aircraft guns, he would state, as far as was consistent with the public interest, the nature of the orders under which they acted, and who was responsible in the event of failure

to give the order to fire, said: There is no conflict of opinion as to the duties of officers commanding anti-aircraft guns. The nature of the orders under which these officers act cannot in the interest of the public be made known, except to say that all the officers in charge of guns have the most stringent orders to fire at hostile aircraft whenever they have any chance of hitting them. In the event of an anti-aircraft gun failing to fire, the officer in charge of the gun is alone responsible.

The Zeppelin Raids—Mr. Billing asked the Prime Minister whether it was with the sanction of the Government that the actual number of deaths from Zeppelin raids had been withheld from the public; and could he give an assurance that in future there should be no attempt to conceal the total casualties.

Mr. Asquith: The numbers of deaths from Zeppelin raids have never been concealed. The exact figures are carefully collected by the police and are published in full. The numbers are often increased by deaths from wounds, and in such cases revised figures are published. I must express my surprise that the hon. member should have thought fit to make the allegation contained in the first part of the question.

Mr. Billing asked whether the Prime Minister wished him to give the facts upon which he had based his question.

Mr. Asquith: I have given my answer.

Inquiry into Air Services—In reply to Mr. Billing, who asked the Prime Minister whether, in view of the public anxiety as to the condition of the Air Services, he could now make an announcement as to the nature and scope of the inquiry into the allegations of the member for East Herts, Mr. Asquith said: The terms of reference to the Committee of Inquiry will be as follows: To inquire into and report upon the administration and command of the Royal Flying Corps, with particular reference to the charges made both in Parliament and elsewhere against the officials and officers responsible for that administration and command, and to make any recommendations in relation thereto. The names of the committee will be announced as soon as possible.

Mr. Billing: Will the right hon. gentleman state when this inquiry is likely to take place?

Mr. Asquith: With all possible promptitude.

Air Committee—Mr. King (L., Somerset, North) asked the Prime Minister whether he could give any information concerning the resignations of the Earl of Derby and Lord Montagu from the Joint Air Committee, and whether the Committee still continued its labours.

Mr. Billing (Ind., Herts, East) put three questions in which he asked the Prime Minister whether he would communicate to the House the reasons for these resignations; what proposals Lord Derby and Lord Montagu had made for making the Committee an effective instrument; and whether the Prime Minister would seek to establish some body that would have real power and responsibility in the effective organisation of our air services.

Mr. Asquith: All the aspects of this question are under consideration. I hope to make a statement on this subject early next week.

Mr. Billing: Does the right hon. gentleman propose to make some statement which will enlighten the public before the House adjourns next week?

Mr. Asquith: I hope it will enlighten the public.

HONOURS FOR THE R.F.C.

April 15

MILITARY CROSS

Capt. Eric Mackay Murray, Q.V.O. Corps of Guides, I.A., attached R.F.C.

For conspicuous gallantry and determination. He has flown continually in all winds and weathers, and carried out many daring reconnaissances with great skill.

Capt. Thomas Ralph Wells, 33rd Punjabis, I.A., and R.F.C. (dated January 1).

FOREIGN DECORATIONS

The King has granted authority for the wearing of the following decorations conferred by the Emperor of Russia:—

Fourth Class of the Order of St. Vladimir

Major and Brevet Lieut.-Col. (temporary Brigadier-General) W. S. Brancker, R.A., and Capt. and Brevet Lieut.-Col. F. H. Sykes, 15th Hussars.

Second Class of the Order of St. Stanislas

Major (temporary Lieut.-Col.) H. R. M. Brooke-Popham, D.S.O., Oxfordshire and Buckinghamshire Light Infantry (General Staff Officer, 1st Grade, R.F.C.).

Third Class of the Order of St. Anne

Capt. and Brevet Major (temporary Lieut.-Col.) W. D. Beatty, R.E. and R.F.C. (Assistant Director of Military Aeronautics); Capt. (temporary Major) R. B. Martyn, Wiltshire Regiment and R.F.C.; Major W. W. Warner, late Indian Army, General Staff Officer, 2nd Grade; Major W. B. Caddell, R.A., Deputy Assistant Director of Military Aeronautics.

AIRCRAFT IN ACTION

OFFICIAL INFORMATION

ENGLAND

April 11—German Machine Driven Down—From General Headquarters: "In the course of eight fights in the air yesterday (April 10) our machines drove down one of the enemy's without sustaining any loss. During to-day (April 11), however, one of our aeroplanes was brought down by gunfire."

April 16—Raid on Constantinople—Admiralty announcement: On the evening of April 14 a raid on Constantinople was carried out by three naval aeroplanes. Bombs were dropped on the Zeitunlik powder factory and the aeroplane hangars. Another naval aeroplane visited Adrianople and dropped bombs on the railway station. The following were the officers who took part in the raid: Squadron-Commander J. R. W. Smyth-Pigott, Flight-Lieutenant K. S. Savory, Flight Sub-Lieutenant R. S. W. Dickinson, Flight Sub-Lieutenant I. H. W. Barnato. All have returned safely. The flight to Constantinople and back measured over 300 miles and, though fine weather prevailed at the start, adverse conditions supervened, with wind, rain and thunderstorms.

(See Turkish official)

FRANCE

April 10—Three Fokkers Brought Down—During the daytime on April 8 one of our pilots, during an aerial fight in the Verdun region, brought down a Fokker, which fell in our lines near Esnes. On the 9th another Fokker was brought down by the fire of our special guns. The machine fell in the Woivre in the German lines. A third Fokker landed in Champagne. The machine was intact. Its pilot was captured. This afternoon (April 10) a German aeroplane flew over Nancy and dropped two bombs, which only caused slight material damage.

April 11—Raid on Nantillons—During the night of April 10-11 one of our bombardment squadrons on two different occasions dropped twenty-seven and twenty-one shells on the stations of Nantillons and Briailles. The same squadron rained projectiles on the emplacement of a long range 380 mm. (15 in.) gun.

April 11—German Machine Brought Down—This morning (April 11) one of our pilots brought down a German aeroplane, which fell in our line near Badonvillers. The two enemy aviators were killed in their fall.

RUSSIA

April 10—German Aerial Activity—German aeroplanes dropped bombs near Remershof and Dvinsk railway stations. On the Oginski Canal (in the centre) enemy aeroplanes dropped bombs on our lines.

April 14—Enemy Aeroplane Brought Down—Near the station at Seslavino one of our batteries brought down an enemy aeroplane which came to earth near the township of Glubokoe. On the left flank, near Chotin, at about 11 a.m., on April 12, an enemy aeroplane coming from the direction of Bojan was met by our aeroplanes, and was forced to beat a retreat. At the same time another enemy aeroplane succeeded in reaching Ivantz on the Dniester, opposite Chotin, and in dropping five bombs, wounding a sentry. On hearing of this the Emperor, who at that time was reviewing troops six versts north of Jwane, gave orders that the wounded man should be decorated with the Fourth Class of the Order of St. George.

April 15—Raid on Czernowitz—Yesterday (April 14) our aeroplanes dropped 50 bombs on the stations at Zuezka and Northern Czernowitz. All the machines returned undamaged.

(See Austrian official)

ITALY

April 10—Airship Raid on Riva—Last night (April 9) one of our dirigibles flew over the fortified position of Riva and dropped forty grenades and torpedoes on the works emplacements, the railway, and the military buildings. The results of the bombardment were observed to be very effective. The airship was caught by the enemy's searchlights and rockets and subjected to intense artillery and rifle fire, but nevertheless returned safely to our lines.

April 11—Bombs on Grado—On the night of April 10 enemy seaplanes dropped eleven bombs on Grado. There were no casualties and only unimportant material damage was caused.

April 11—Austrian Misstatements of April 8—The *communiqué* respecting the unfortunate Austrian aeroplane raid at dawn on the 7th instant, over the plains of Lower Friuli, states that the stations of Casarsa and San Giorgio di Nogare were hit with visible success, whereas in actual fact the latter was not touched, and Casarsa station was only very slightly damaged, as our anti-aircraft guns prevented the near approach of the enemy aircraft. Austrian aeroplanes were shot down during the raid by our pursuing squadrons; no mention is made in the *communiqué* of several that were lost. Reference is merely made to the fact that three Austrian aviators failed to return, whereas two Austrian aeroplanes were shot down and four aviators captured one of whom was severely wounded. Finally, to justify the disastrous results of this raid, the same *communiqué* of April 7 states that the Austrian aviators flew extremely low. On the contrary the two enemy aeroplanes were attacked at a great height by our aeroplanes, which compelled them to descend by machine-gun fire. The enemy *communiqués* further lie to attempt to justify the disasters to their aerial fleet, which from March 27 to April 7 lost twelve machines.

April 12—Successful Air Raids—In addition to the part played by the Italian Navy on the occasion of the Austrian air raid on Ancona on April 4, during which the Italian naval guns brought down three Austrian seaplanes, Italian naval machines have participated in other operations. In the Lower Adriatic two Italian seaplanes alighted on the sea near the coast and the four officers landed, set fire to a signal station, destroyed a number of telegraph poles, blew up a small munition depot, ignited several coal stacks, and destroyed the landing-stage. In the Upper Adriatic one of our dirigibles dropped about 1,000 lb. of explosives on the railway station at Nabresina. All the bombs exploded, and the machines returned unharmed in spite of the lively fire of the enemy's artillery. Also in the Upper Adriatic, naval anti-aircraft batteries brought down an enemy seaplane. Two naval officers in the machine were made prisoners.

AUSTRIA

April 10—Caproni Destroyed—Vienna reports claim to have destroyed an Italian Caproni aeroplane.

April 15—Raid on Czernowitz—Yesterday morning (April 14), soon after 5 o'clock, seven hostile aeroplanes, four of them battle-planes, appeared above Czernowitz and the railway establishments north of the town. Some of our aeroplanes ascended in pursuit, and succeeded, after a two hours' fight in the air above Czernowitz, in bringing down a battle-plane. The hostile squadron fled. An aeroplane which had been hit fell headlong near Bojan, between the Russian line and ours, where it was destroyed by our gunfire. The observer was killed. Our aeroplanes returned undamaged.

(See Russian official)

GERMANY

April 10—Four Allied Aeroplanes Lost—In various aerial fights which took place one French aeroplane was shot down to the south-east of Damloup and one north-east of Chatcau-Salins. The occupants of the former are dead. An enemy aeroplane was seen to crash to earth in the village of Loos, and another in the Gaillette Forest.

April 11—Two Enemy Machines Brought Down—Two enemy aeroplanes were brought down south-east of Ypres by means of our anti-aircraft guns.

April 12—French Aeroplane Brought Down—In an air fight a French aeroplane was brought down near Ornes in the Woivre. The pilot was killed.

April 14—Raid on Ghevgegi—On Wednesday night (April 12) enemy aviators unsuccessfully bombarded Ghevgegi and Bogoroditza.

TURKEY

April 16—Raid on Constantinople—On the night of April 14-15 two hostile aeroplanes ascended from the Dardanelles and flew over Constantinople at a considerable height, dropping several incendiary bombs on two villages near the town, without causing any damage. Owing to our anti-aircraft fire, the hostile airmen lost sight of their objective and retired in the direction whence they came.

(See Admiralty announcement)

CASUALTIES

ROYAL NAVAL AIR SERVICE

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED

January 12

Bolas, Flight Sub-Lieut. James S., R.N.

UNOFFICIALLY REPORTED KILLED

April 10

Tweedy-Smith, Lieut. D., R.F.C.

Lieut. Douglas Tweedy-Smith, Royal Flying Corps, who died on April 10 at the Netley Red Cross Hospital, was the

second son of Mr. Tweedy-Smith. He was an old member of the London University O.T.C., and on the outbreak of war received a commission in the Middlesex Regiment, while early last year he transferred to the Royal Flying Corps. After technical aviation work in sundry centres he was promoted inspector of aeroplanes at Farnborough. In this capacity he had after passing machines to fly with them to France, and in his exacting duties he met with one serious accident. In March he recovered from a dangerous illness and returned to duty, but he was again taken ill after a flight from the front and conveyed to Netley, where he died.

INJURED

April 11

Gerrard, Wing Commander Eugene L., R.N. (Lieut.-Col. R.M.L.I.).

WOUNDED

Undated

Segrave, Capt. H. J., Wiltshire Regt., attached R.F.C.

PREVIOUSLY REPORTED AS MISSING ARE NOW REPORTED TO BE PRISONERS IN GERMANY

April 17

Reid, Flight Lieut. George H., R.N.

Hay, Flight Lieut. John F., R.N.

Knight, Flight Sub-Lieut. Cyril G., R.N.

Hoblyn, Midshipman Stanley E., R.N.R.

[These officers took part in the Schleswig raid.]

ROYAL FLYING CORPS

OFFICIALLY REPORTED MISSING AND UNOFFICIALLY REPORTED KILLED

Welsford, Second Lieut. G. J. L., Middlesex and R.F.C.

OFFICIALLY REPORTED MISSING AND UNOFFICIALLY REPORTED WOUNDED AND PRISONERS OF WAR.

Pinder, Second Lieut. F. G., R.F.C.

Wilson, Second Lieut. T. C., R.F.C.

OFFICIALLY REPORTED MISSING AND UNOFFICIALLY REPORTED PRISONERS OF WAR

Halford, Second Lieut. E. A., Wiltshire, attached R.F.C.

Joyce, Lieut. W., Bedfordshire, attached R.F.C.

WOUNDED

Bramwell, Second Lieut. H. P., Argyll and Sutherland Highlanders, attached R.F.C.

UNOFFICIALLY REPORTED KILLED

April 5

Nichol, Lieut. J., Royal Scots Fusiliers and R.F.C.

Lieut. John Nichol, Royal Scots Fusiliers and Royal Flying

Corps, was the second son of Dr. and Mrs. Nichol, of Margate. He received his commission in 1912. He was prevented from going to the front with his regiment by an accidental injury, and after a few months with another battalion was attached to the Royal Flying Corps as an observer. In this capacity he served with the 3rd Squadron from February to October, 1915, and was then sent home to be trained as a pilot. He "took his wings" in January last, and met with a fatal accident on duty on April 5.

April 8

Thomas, Second Lieut. W. N., R.F.C.

Second Lieut. William Norman Thomas, Royal Flying Corps, killed in action on April 8, was director of W. S. Thomas and Sons, contractors, Oswestry. He joined the Montgomeryshire Yeomanry as a trooper in September, 1914, and was given a commission in the Shropshire Light Infantry in June last, and took his flying certificate at Hendon in the following month. He was aged 28.

The following appeared in the obituary columns:—

BAILEY, John Winckworth, M.A., Second Lieut., R.F.C., dearly-beloved and only surviving son of the Rev. John and Mrs. Bailey, of Rochester, killed while on duty on March 31, 1916, aged 33.

MISSING

Undated

Coleman, 10805 Second Air Mech. E. R.

Walker, 1941 First Air Mech. A.

DIED

Burns, 3259 Second Class Air Mech. A.

KILLED

Thomas, Second Lieut. W. N., R.F.C.

WOUNDED

Brooks, Lieut. C. A., Wilts Regt. and R.F.C.

Duff, Capt. I. A. J., Dorset Regt., attached R.F.C.

Moncrieff, Lieut. D. C., R.F.A., attached R.F.C.

Robertson, Second Lieut. H. S., R.F.C.

Stodart, Capt. D. E., R.F.C.

APPOINTMENTS

ROYAL NAVAL AIR SERVICE

The following Temp. Flight Sub-Lieut. has been promoted to rank of Temp. Flight Lieut.:

L. A. Hervey: April 1.

T. M. Morgan, entered as Probationary Flight Sub-Lieut. (temp.), with seniority of March 22, and appointed to *President*, additional, for R.N.A.S.

Temp. commissions as Sub-Lieut. (R.N.V.R.) have been granted to the following, with seniority of April 10:

W. G. Watson (Air Mechanic, 1st Grade), and M. T. Spence, both appointed to *President*, additional, for R.N.A.S., and L. E. Nicholson, to *President II.*, additional, for R.N.A.S.: April 17.

Lieut.:

The Hon. R. Coke, to *President II.*, additional, for R.N.A.S.: April 11.

Flight Sub-Lieut. (Temp.):

L. A. Hervey, promoted to Flight Lieut. (temp.), with seniority of April 1.

C. F. M. Chambers, entered as Probationary Flight Sub-Lieut. (temp.), with seniority of April 25, and appointed to *President*, for R.N.A.S.

Temporary Commissions (R.N.V.R.) have been granted with seniority as follows:

A. F. H. Smallpiece, as Lieut.: April 12.

E. T. S. Jones and G. S. Hewett, both as Sub-Lieuts., and both appointed to *President*, for R.N.A.S.: March 17 and April 12 respectively.

G. A. Richardson (Air Mechanic, 1st Grade), as Sub-Lieut.: April 12

ROYAL FLYING CORPS

A.G.'s and Q.M.G.'s Staff

A.A. and Q.M.G.:

Brevet Lieut.-Col. F. H. Sykes, 15th Hussars: March 27.

Squadron Commanders, from Flight Commanders, and to be Temp. Majors whilst so employed:

Capt. J. H. A. Landon, Essex Regt., T.F.; Temp. Capt. C. G. S. Gould, R.A.: Temp. Capt. G. D. Mills, Notts and Derby Regt.: March 1.

Capt. R. G. Cherry, R.A.: March 15.

Capt. C. R. S. Bradley, 4th Cavalry, I.A., and Capt. J. A. Chamier, 33rd Punjabis, I.A.: March 27.

Flying Officers:

Temp. Second Lieut. T. H. Bayetto, General List: March 12.

Second Lieut. J. K. Aird, S.R.; Second Lieut. A. C. Ferguson, S.R.; Second Lieut. M. H. Thunder, S.R.; Lieut. H. Clements-Finnerty, 17th Lancers, from Flying Officer (Observer): March 23.

Second Lieut. H. M. T. Lehmann, Essex Regt., and to be seconded; Second Lieut. W. G. Albu, Royal Irish Fusiliers,

S.R., and to be seconded; Temp. Second Lieut. S. E. Lewis, General List; Second Lieut. J. S. Beatty, S.R.; Second Lieut. W. R. C. Dacosta, S.R.; Second Lieut. S. F. Heard, S.R.; Second Lieut. C. Monckton, Royal Irish Fusiliers, S.R., and to be seconded; Lieut. W. H. Doré, 32nd (Res.) Canadian Infantry Bn.: Temp. Second Lieut. C. W. Hyde, R.A., and to be transferred to General List; Second Lieut. R. A. Stubbs, Royal Munster Fusiliers, S.R., and to be seconded; Second Lieut. A. Goulding, S.R.: March 28.

Lieut. H. J. Payn, R.E., Special Reserve, from a Flying Officer (Observer); Temp. Second Lieut. H. Barker, East Yorks Regt., and to be transferred to General List; Second Lieut. S. G. Hodges, Wilts Regt., and to be seconded: May 25.

Second Lieut. F. G. S. Williams, General List; Second Lieut. C. T. H. Vaisey, S.R.; Second Lieut. F. R. Hardie, 3rd Hussars, from a Flying Officer (Observer): March 31.

Flying Officers (Observers):

Brevet Major A. J. Ross, R.E., and Capt. E. H. M. O'Farrell, Royal Irish Fusiliers, and remain seconded: October 21.

Temp. Second Lieut. W. H. Davies, King's Own Scottish Borderers, and to be transferred to General List; Second Lieut. J. W. Halcrow, Dorset Regt., S.R., and to be seconded; Temp. Second Lieut. F. P. Holliday, General List; Second Lieut. E. L. Benbow, R.A., and to be seconded: March 10.

Capt. I. De la Bère, Dorsets, and seconded; Temp. Second Lieut. V. G. A. Bush, H.L.I., and transferred to General List; Second Lieut. J. Milner, Durham Light Infantry, S.R.; Temp. Second Lieut. F. G. Wilson, R.F., and transferred to General List; Temp. Second Lieut. H. L. Wallis, R.A., and transferred to General List: March 21.

Balloon Officers:

Temp. Second Lieut. H. O. Hope, K.R.R.C., and transferred to General List: March 6.

Temp. Lieut. O. H. Weekes, A.S.C.; Temp. Second Lieut. G. T. Dunstan, R. W. Surrey, and transferred to General List; Temp. Second Lieut. G. A. N. Mitchell, R.F.: March 11.

Capt. D. Rainsford-Hannay, 53rd Sikhs (F.F.), I.A.: March 20.

Assistant Equipment Officers:

Second Lieut. A. E. Oxley, S.R.: February 3.

Second Lieut. G. C. Burnand, S.R.: March 1.

Second Lieut. L. A. Sturrock, I.A., Reserve of Officers: March 15.

Second Lieut. A. J. Rickie, S.R.: March 18.

Temp. Lieut. A. C. Bishop, Berkshire Yeomanry: March 23.

Temp. Second Lieut. H. M. Bentley, General List: March 26.

Second Lieut. J. L. Finney, S.R.: March 27.

Temp. Second Lieut. H. T. Birdsall, General List, and Temp. Second Lieut. B. J. Mitchell, General List: March 28.

Second Lieuts., S.R., J. E. Rendle, E. L. P. Morgan, O. C. Morison, L. Bawn, L. H. B. Cosway, T. Worswick : March 30.

The following temporary appointments are made at War Office :—

General Staff Officer, 1st Grade :

Major (temporary Lieut.-Col.) L. E. O. Charlton, D.S.O., Lancashire Fusiliers, from a Wing Commander, R.F.C., and to retain temp. rank while so employed, vice Major (temp. Lieut.-Col.) C. C. Marindin, R.A. : March 19.

Directors :

Brevet Lieut.-Col. (temp. Brig.-Gen.) W. S. Brancker, R.A., from a Brigade Commander, and to retain temporary rank while so employed; Brevet Lieut.-Col. (temp. Col.) D. S. MacInnes, D.S.O., R.E., from a Deputy Director, and to be Temp. Brig.-Gen. while so employed : March 27.

Flight Commanders, from Flying Officers, and to be Temp. Capts. while so employed :

Temp. Lieut. A. M. Wilkinson, Hampshire Regt., T.F. : February 22.

Lieut. M. D. Methven, London Regt., T.F. : March 1.

Second Lieut. J. A. Crook, S.R. : March 2.

Lieut. H. H. Kitchener, R.E. ; Lieut. W. A. G. Bellew, S.R. ; Second Lieut. P. G. A. Harvey, 3rd Dragoon Guards ; Second Lieut. C. A. A. Hiatt, Norfolk Regt. : March 29.

Lieut. E. F. Norris, S.R. : March 31.

The following N.C.O.'s to be Temp. Second Lieuts. for duty with R.F.C. :

Serg. N. B. Harris, from Royal Fusiliers (City of London Regt.) ; Corp. (Motor Cyclist) H. Floyd, from R.E. ; Corp. E. T. Pruett, from R.E. : March 19.

Equipment Officers, and to be Temp. Capts. whilst so employed :

Lieut. C. Defries, S.R., from an Assistant Equipment Officer ; Lieut. S. A. Currin, S.R., from an Assistant Equipment Officer ; Second Lieut. H. Lee, S.R., from an Assistant Equipment Officer ; Second Lieut. T. E. St. C. Daniell (incorrectly described in *Gazette* of November 15, as T. C. Daniell), General List ; Second Lieut. T. G. Clarson, from an Assistant Equipment Officer : January 30.

Lieut. C. P. Ogden, S.R., from an Assistant Equipment Officer : March 25.

Assistant Equipment Officers, Second Lieuts., Special Reserve :

J. R. Frankish and R. Scott : April 4.

The following to be Temp. Second Lieuts. for duty with the R.F.C. :

Pte. R. G. Hornby, from Liverpool Regt., T.F. ; Pte. S. N. Williams, from North Somerset Yeomanry, T.F. ; Corp. P. A. Wright, from 1st Canadian Pioneer Bn. ; Lee.-Corp. L. H. Stowell, from Inns of Court O.T.C. : April 15.

SPECIAL RESERVE

Second Lieuts. (on probation) confirmed in rank :

E. L. P. Morgan, T. Worswick, L. Bawn, L. H. B. Cosway, J. S. Beatty, W. R. C. Dacosta, S. F. Heard, A. Goulding. A. J. Rickie to be Second Lieut. : March 18, but with seniority as from December 27.

The Christian names of Second Lieut. Lester Edward Taylor are as now described, and not as in *Gazettes* of September 13, 1915, and November 11th, 1915.

J. E. Rendle to be Second Lieut. : March 10.

To be Second Lieuts. (on probation) :

F. A. Crispin : March 14.

C. N. Seemann, A. F. Palmer, E. Stokes, J. E. Wight : March 20.

LORD MONTAGU ON AERIAL REFORM

On Wednesday, April 12, Lord Montagu of Beaulieu, whose resignation as an advisory member of the new Joint Air Committee has been accepted, delivered a speech at Birmingham. The following is a summary of the main points of his speech :

Lord Montagu said it had been suggested that he should state fully and frankly what led him and Lord Derby to resign from the War Air Committee. He asked his audience to consider whether he was not right in demanding that the present system of divided administration for the air service should be replaced by a unified system, and to say whether it was possible to go on with the Navy and Army at cross-purposes, with no definite air policy, and with increasing danger from the air to the people who lived within these islands.

When I was invited by the Prime Minister (Lord Montagu continued) to join the War Air Committee I felt that because I had been a critic I was all the more bound to help if I could, and people who criticised me at the time for joining the Committee did so perhaps rather light-heartedly. I joined the Committee with high hopes. I thought it might become, and Lord Derby had assured me that there was a chance of its so

doing, the nucleus of a Board of Aviation, the foundation upon which there might be built a Ministry of Aviation. I thought it meant more than its limited terms of reference seemed to imply. But when I had sat on the Committee during a few meetings I discovered that it had practically no real power at all, and that no decisions could be come to unless all the members on it were unanimous. It could forward no recommendations unless the representatives of the Navy and Army entirely agreed, and I could see at once that it was unlikely, if any criticism was put forward or any comment upon the two services, that you could ever get a unanimous decision.

The Committee had no executive power, and though I believe it was put forward in good faith, I felt, and Lord Derby felt, that it was perhaps lulling the public into a sense of false security and I for one was determined not to be made use of in that manner. (Cheers.) After a time—I do not think I am guilty of a breach of confidence in saying—we came to the question of making an interim report. We were quite unable to agree on the terms of that report, and gradually both Lord Derby and myself came to see that the only fair and honest thing was to resign, and ask the Government if they wanted anything done to appoint some real body—call it a Board or Ministry or what you like—that could be of real service in solving these great problems.

There is no part of industrial England to which a Zeppelin could not fly and rain destruction. The more important the district the more likely you are to be attacked.

Years ago many of them had warned the Government of the seriousness of the question, and he believed that in this, as in many things, the people of the country were far ahead of Parliament, and Parliament was ahead of the Government. In this war the power of defence had grown so largely that it had largely stopped offence. This could only have one result. On the sea it would drive warfare into the sphere of submarines, and on land it would drive it into the air. There was still time while the war was going on to found what he would call an Imperial Air Service, for he wanted to take the Dominions in as well.

To-day we had no airships to act as eyes for our Fleet. The German Fleet had Zeppelins spread over the North Sea, but we had only a few seaplanes, and our magnificent service of destroyers and submarines. A navy that had a chance of seeing your strategical arrangements from a distance of 70 to 80 miles had an enormous advantage over a navy that did not possess eyes of that kind.

Then he came to our own shores. At the beginning of the war he for one warned the authorities of the danger of Zeppelin attacks. He foresaw that these great monsters would come over, and that, so far from being a subject for laughter, they were going to be a very serious menace. In the first few months of the war no Zeppelins came, and the whole thing was neglected. Now we had had 27 or 28 raids, some of them very serious ones, and these raids would not only be repeated, but they would become more serious as time went on. In the 20th month of the war we had just begun to have a system of anti-aircraft defences in this country. He was not going to reveal secrets or talk about dummy guns—(laughter)—but he would say that there was hardly a town, with the possible exception of London, which could be properly defended to-day against attacks from Zeppelins. Our anti-aircraft corps, like our pilots, included many gallant fellows, skilled men, and able commanders, but what could they do with guns that were too small and preparations which were inadequate?

He would like his audience to realise the truth of the phrase "One element one service." Was it possible to go on running the air defence of the country or an air offensive by two departments, sometimes three, without any link between them, and with traditional jealousies existing between them? The curse, for it was a curse, of all Government departments was that of thinking departmentally instead of nationally.

He knew there was an argument that if they set up a Ministry of Aviation, instead of the Navy and Army having their little tiffs there would be a third department to quarrel with, and that would be a bad thing. If, however, they put into the Ministry of Aviation men of ideas, and, he hoped, also, men of tact, though there would be great difficulties, these were not to be compared with the danger of leaving things as they were. When the Ministry of Munitions was first established there was a very tough fight with certain departments in the War Office, but the great point was that Mr. Lloyd George formed the department and got the stuff, millions and millions of rounds, and thousands of guns. It was something of the same kind he wanted to see established with regard to aviation.

He had submitted a scheme to the Cabinet, and before disclosing the details of this it was only fair to give the Cabinet a chance to consider the proposal. He could say, however, that he did not wish to interfere with the executive control of their aircraft by either the Commander-in-Chief of the Army or the Admiral of the Grand Fleet. His first object, if he should induce the Government to establish a Board of Aviation, would be to secure a body which would hand over trained men and complete machines for the Army and Navy. The Department would deal with design, construction, inspection, supply, contracts, scientific research, and the enlistment, training, and allocation of personnel.

THE EASTER HOLIDAYS AT HENDON

Easter usually marks the re-opening of the more active flying season at Hendon, when the improved conditions and the lengthening days permit of the special weekly flying displays being resumed in earnest. Accordingly the Grahame-White Aviation Co. have this year again organised special flying displays for Good Friday, Saturday, Sunday, and Monday Bank Holiday. As usual, the meetings will open each day at 3 p.m.

SOCIAL INTELLIGENCE

ANSTEY—WESTMACOTT—On April 4, at the Parish Church, Rye, by the Rev. A. P. Howes, Capt. Chisholm Wilfred Anstey, South Wales Borderers and Royal Flying Corps, to Dorothy Ethel, eldest daughter of Major H. R. Westmacott, the Welsh Regiment, and Mrs. Westmacott, Belvedere Cottage, Rye, Sussex.

The marriage took place at Netley on April 10 of Flight Lieutenant Theodore Marburg, Royal Flying Corps, to the Baroness Gisele de Vivario, of Liège. The bridegroom, who is the son of Mr. T. Marburg, formerly American Minister at Brussels, was an undergraduate of Pembroke College, Oxford, until last summer, when he became a pilot in the Royal Flying Corps. Early in October he went to France, and on December 7 he met with an accident. He and his observer were starting from an aerodrome on a "spotting" flight in a high wind, and had reached a height of about 200 ft. when the engine failed and the machine nose-dived to the earth. The observer escaped with nothing more serious than a nervous shock, but Lieutenant Marburg's left knee was pierced by a piece of woodwork, and, in spite of every effort of the medical services, it was found necessary five weeks after the accident to amputate the leg above the knee. The bride is a refugee from Liège.

The engagement is announced between Flight Commander Charles D. Breese, Royal Navy, younger son of Mr. G. C. Breese, late of Chigwell, Essex, and Mary Eleanor, youngest daughter of Mr. H. C. Tweedy, of Fowey, Cornwall, late of Cloonamahon, County Sligo.

LEGAL NEWS

R.A.F. EMPLOYEES

At the Farnborough local Tribunal on April 11 fourteen young men, all employees recently discharged from the Royal Aircraft Factory, appeared to ask advice on their position under the Military Service Act. Their spokesman stated that many of them in the past had wished to enlist, but had been refused enlistment because of their position in the Royal Aircraft Factory. With the formation of a Territorial branch of the Royal Flying Corps, they all (with the exception of one man rejected on medical grounds) enrolled for the full term of four years, and were sworn in for Imperial Service. When they were dismissed from the factory, however, they were told that they were automatically discharged from their Territorial corps. Applications for enlistment in the Royal Flying Corps, the R.N.A.S., and the Royal Engineers had been refused. The tribunal agreed to forward the statements of the deputation to the proper authorities.

AIR SERVICE INQUIRIES

Edgar Charles Middleton was charged at Dover on April 13 with attempting to elicit information with respect to the movements or disposition of the Royal Naval Air Service such as might be of value to the enemy.

Mr. Ernest Chitty, who prosecuted under Admiralty instructions, said the defendant for a short time was a probationary Flight Sub-Lieutenant Royal Naval Air Service quartered at Dover. At present he was a civilian journalist and wrote articles, he believed, for the *Daily Mail* as "The Air Pilot." On Wednesday (April 12) the defendant interviewed three Royal Naval Air Service officers at Dover, and, in conversation with them, said he had come there to do "a bit of spying." The expression "a bit of spying," Mr. Chitty explained, was not used in the traitorous sense of the term, but as meaning obtaining information that the defendant was not entitled to get. The defendant also said to one officer that he was doing spying for Mr. Pemberton Billing and for the *Daily Mail*, which was running Mr. Billing. He invited the officers to lunch and in conversation endeavoured to obtain from them information as to where Royal Naval Air Service officers were stationed at present. Such information was clearly directed to the point of the readiness or unreadiness to meet a sudden aerial attack. The defendant wished to know the proximity of the officers' quarters to the posts whence they were to start. Obviously it would be of use to the enemy to know where or to what extent the air forces of Dover were prepared to meet a sudden air raid.

Detective-Inspector Mole, Scotland Yard, spoke to arresting the defendant the previous afternoon on instructions received at the Admiralty office. He found the defendant at the Grand Hotel luncheon with Flight Lieutenant Cannon, Royal Naval Air Service. After the defendant had been taken to the Admiral's office instructions were given that he should be removed to the police station. When charged at the police station the defendant replied: "I deny it wholly and entirely. What I have said was

only to my friends in the Air Service whom I know, and it is purely a personal matter."

Mr. Chitty applied for a week's remand, and said the Admiralty opposed bail.

Mr. Foulkes-Jones, for the defence, said Mr. Middleton was formerly in the Air Service, but was invalided owing to a nervous breakdown thirteen months ago, since when he had been engaged in journalism. He was at Dover for a perfectly innocent reason engaged in journalistic work, making inquiries into a matter which had been the subject of inquiry in Parliament and the country for many weeks past. When the time came he thought he would be able to satisfy the Bench that the defendant was perfectly innocent in the matter.

The defendant was remanded in custody for a week.

ANOTHER FACTORY INQUEST

An inquest was held at Norwich on April 13 into the death of a young woman named Ethel Annie Overton, who, after inhaling a preparation at the manufactory where she worked, complained of pain in the throat. She died after a few days' illness. It was explained that the preparation mentioned threw off a poisonous gas. To cope with the danger electric fans had been installed in the factory. The medical evidence was that death was due to toxic jaundice, caused by inhaling a poisonous gas.

NO KITE-FLYING IN PARKS

The flying of kites has been prohibited at the parks and open spaces controlled by the London County Council, except when authorised by competent military authority.

BOOKS RECEIVED

- "LEARNING TO FLY." London: T. Grahame-White Aviation Co., Ltd., 1916. 23 pp., illus.
- "NOTES ON SCREW GAUGES." (Enlarged Issue I.). The National Physical Laboratory, 1916. 29 pp., figs. Price 1s. 6d.
- "THE HANDBOOK OF THE DOUGLAS MOTOR CYCLE." Bristol: Douglas Bros., 1916. 114 pp., figs. Price 1s.
- "AIR-SCREWS." M. A. S. Riach. London: Crosby Lockwood and Co., 1916. 128 pp., figs. Price 10s. 6d. net.
- "OVER THE FRONT IN AN AEROPLANE." Ralph Pulitzer. New York and London: Harper Brothers, 1916. 159 pp., illus. Price 3s. 6d.

COMPANY NEWS

NEW COMPANIES REGISTERED

SOCIETY OF BRITISH AIRCRAFT CONSTRUCTORS, LTD., St. Stephen's House, Victoria Embankment, Westminster.—A company, limited by guarantee, with 100 members, each liable for £3 in the event of winding-up, to encourage, promote and protect the British aircraft industry; to protect the general interests of companies, firms, and persons engaged therein, etc. The management is vested in a Council, the first members of which are: Sir Vincent Caillard (Wolseley Motor Car Co., Ltd.), R. O. Cary (Sopwith Aviation Co., Ltd.), Sir Arthur T. Dawson (Beardmore and Co., Ltd.), H. Wade Smith (British and Colonial Aeroplane Co., Ltd.), G. Holt Thomas, H. F. Wood (Vickers, Ltd.), Howard T. Wright (J. Samuel White and Co., Ltd.). Secretary, C. V. Allen.

STANLEY AVIATION CO., LTD., Stanley Works, Langton Road, Cricklewood, N.W.—Capital £1,000, in £1 shares. Manufacturers of and dealers in all kinds of flying machines and component parts thereof, maintainers of hangars, garages, sheds and aerodromes, mechanical engineers, etc. First directors, Joseph Andre, Maurice Phinstag, and Arkadius Gunsbourg.

WELLS AVIATION CO., LTD., 10a, Elystan Street, Chelsea, S.W.—Capital £10,000, in £1 shares. Secretary, F. W. Doyle Jones.

ASSOCIATION OF BRITISH MOTOR AND AIRCRAFT MANUFACTURERS, LTD., 173, Fleet Street, E.C.—A company limited by guarantee, with 100 members, each liable for £1 in the event of winding up. Objects, to protect the British motor and aircraft industry (which expression includes companies, firms and persons carrying on within the U.K., Channel Islands, India, or in any Colony, Dependency, or Possession of Great Britain). The subscribers are: E. Manville (Chairman, Daimler Co., Ltd.), F. R. Simms (Chairman, Simms Motor Units, Ltd.), F. W. Shorland (Managing Director, Clement Talbot, Ltd.), J. M. Young (Secretary, John I. Thornycroft and Co., Ltd.), R. Dennis (Managing Director, Dennis Bros. (1913), Ltd.), H. T. Vane (Managing Director, D. Napier and Sons, Ltd.), A. Spurrier (Director, Leyland Motors (1914), Ltd.), H. Johnson (London Manager, Joseph Lucas, Ltd., Birmingham), S. Straker (Managing Director, Straker-Squire (1913), Ltd.), H. C. B. Underdown (Chairman, Commercial Cars, Ltd.), G. Young (Director, Albion Motor Car Co., Ltd.), F. Boyle Monkman (London Manager, Halley's Industrial Motors, Ltd.). The management is vested in an Executive Committee, the first members of which are E. Manville and A. Spurrier. Only persons engaged in the British motor and aircraft industry are eligible for membership of the Committee. Secretary, H. Wyatt.

AERONAUTICS

A WEEKLY JOURNAL DEVOTED TO THE TECHNIQUE OF AERONAUTICS

(FOUNDED 1907)

Edited by JOHN H. LEDEBOER, B.A., A.F.Ae.S.

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ONE PENNY

THE INDUSTRY, THE STATE, AND THE ROYAL AIRCRAFT FACTORY

LAST week we dealt, perforce cursorily, with the creation of the Society of British Aircraft Constructors, which we signalled as one of the most important events in the history of British aviation and the most hopeful portent for the future of the industry. We may now fitly devote some space to a brief examination of the aims and purposes of this body, to the main lines of policy and activity which confront it in the near future, and incidentally to the many pitfalls that will beset its path.

And first it is necessary to utter a word of warning to those who in hailing its advent are prone to draw some analogy between it and such a trade federation as the Society of Motor Manufacturers and Traders. In so far as purely trade and exclusively industrial interests are concerned, the analogy is doubtless justified; but after that similarity ceases, for whereas the former represents what in normal peace-time conditions must be regarded as a private self-supporting industry, the latter constitutes the living embodiment and voice of an industry which even in time of peace is mainly devoted to supplying Government, and must for some time to come, though peace were concluded to-morrow, remain essentially a purveyor of war material. The motor industry need never entertain the remotest fear of State competition; it must work out its own salvation; hence the S.M.M.T. fulfils largely the functions of a trade protection society, though its other subsidiary spheres of activity are manifold. Far different is the position of the aviation industry; precisely because it primarily supplies, and from its inception has supplied, war material it has to face active State competition. Again, whereas the prosperity of the motor industry is of importance from the national point of view only in an industrial and commercial sense, the aviation industry must at all costs be maintained and fostered in that it is the mainstay of an important branch of our national defence. This fundamental difference must be carefully borne in mind in considering the future of the new Society of British Aircraft Constructors.

Three points in this respect urgently require to be closely examined in their most important bearings. Firstly, the most urgent reforms which the Society should endeavour to bring about, in the collective organisation of the industry, the planning of the main lines of its future development, and the determination of its relations with the State. Secondly, the position of the private industry relatively to those establishments either directly owned or subsidised by the State, of which the Royal Aircraft Factory may stand as the representative. Thirdly, the constitution of the Society's

membership. This third point, though inherently the least important of the three, is of the most immediate interest, and may therefore be taken first.

* * *

The strength of a trade society lies in the degree of its representativeness of an industry, and in this respect there are two extremes equally to be avoided. It may either represent only a fraction, albeit the major one, of the trade, which spells disunion, or at any rate weakens its authority, especially when dealing with Government, which is constitutionally prone to take advantage of any loophole in this nature. Such, happily, is not the case with the new Society, which includes among its first members every single important and *bona-fide* firm directly and mainly engaged in the construction of aircraft, aircraft engines and parts. But the opposite extreme, which is equally reprehensible, is for a Society, especially in its early stages, when future policy perforce still remains indeterminate and the future is on the lap of the gods, to overload its membership by the inclusion of every firm, down to the smallest, engaged in however insignificant and remote a degree in the production or supply of small aircraft parts, in most cases probably as an infinitesimal portion of its total turnover. The inclusion of every one of such firms may swell the membership list until it attains imposing proportions at first sight, but in reality it only serves to weaken authority. As a safe rule for guidance, it may be laid down that a Society such as this should confine its membership to those responsible firms exclusively or mainly engaged in the production of aircraft and of essential parts. True, the accessories trade should be granted representation, but only within strict and clearly defined limits. The propeller industry, for instance, forms an obvious exception.

* * *

When we come to deal with the first point outlined above we immediately enter upon more difficult and debatable ground, and our path is beset with thorns. It is clear that, if the Society is to justify its existence to the full, it must organise and combine, not only for the immediate future during the continuation of the war, but must look farther ahead, to the halcyon days that will ensue thereafter. It may be said without fear of contradiction that severally and individually the most prominent British aircraft manufacturers are able to hold their own against any other firms in the world. Personally, I would go beyond that and assert emphatically that, *given a free hand*, they would not fail to establish, to use a hallowed phrase, a clear personal ascendancy. But the crux of the whole matter lies in those few words, "*given a free hand*," and all that they imply.

First—and here we tread on delicate ground—the Society must see to it that the British industry is not swamped after the war by the splendidly organised industries in other countries, whether allied or neutral, whose prosperity and rise to affluence have been due mainly, if not entirely, to the purchases and orders of Great Britain and her Allies. The war took us unawares; for our supplies we had perforce to rely largely on the industry of other countries, which was practically brought into being, or, at any rate, raised from bare penury to affluence, *as a result of our requirements*. In regard to the munitions essential for our national defence, we must so organise our home industry as to become self-supporting. We have no need, even under the pressure of the utmost national emergency, to go abroad for our warships or their armament, and the same consideration should apply to the supply of aircraft. This is an obvious national axiom which no one is likely to dispute.

* * *

But why, it may be objected, should our industry be swamped by foreign competition, however friendly, after the war, since it is at least as well organised as any abroad, and since its present prosperity is due in precisely the same measure and owing to the same causes as that of its competitors, to our sudden demand for aircraft, which, if it ceases or normal conditions supervene again, will affect those competitors in just the same or even a more potent degree? The answer is simple. The prosperity and expansion of these foreign industries to a point where—not suffering from our own disabilities—they can produce more cheaply and more rapidly than we can have been brought about by British money. Very well, you may reply; but the same applies to our own British industry, disabilities apart.

* * *

True, but our industry is not only handicapped by the shortage and abnormally high cost of labour and materials, but after the war will be called upon to bear, through increased taxation, a heavy share of the burden of war, from which its competitors will be exempt. If for the time being our industry prospers, if individual firms can show a profit, those profits will disappear almost entirely owing to the heavy incidence of the war profits tax, which will absorb 60 per cent., and through further additional demands on the part of the Ministry of Munitions. The case is not only one of undoubted private hardship; aircraft manufacturers are willing to bear their share of the burden with every other class of the community; the case is one that gravely imperils the future of the whole British industry, whose continued existence is of primary importance from the point of view of national defence.

* * *

Let us examine the matter a little more closely and show in so doing wherein the case of the aircraft industry differs radically from that of almost every other industry. Practically every other industry employed in or transformed into the production of war material existed in pre-war times in a flourishing condition, and has, at best, simply transferred its energies into channels more productive of immediate results. After the war these industries have their own legitimate purposes to fall back upon—the sale of motor-cars or of mangles, or what not—purposes from which they have, under the force of circumstances, been temporarily diverted. Not so with the aviation industry. Spite years of Governmental neglect and apathy—if not of deliberate official discouragement—the industry has slowly expanded, attempted to establish itself on a solid and enduring basis, fraught with the inevitable developments of the future. In so doing the industry, and the leading spirits which guided it, had that measure of foresight which every successive Government lacked—not only in Great Britain, but in other countries. It built itself up in spite of Government and interested opposition. It diverted to itself, spite of opposition, the support of British capital, essential to its continued existence. Fore-

(To be continued)

seeing impending events, and the national drain upon its resources, it organised itself, prepared to meet the sudden demand which it knew to be inevitable. Capital was sunk—in plant, machinery, stock, and skilled labour—though no immediate return was apparent. In a word, the industry was created, without hope of instant profit, such as a legitimate trading firm is wont to reckon it, but solely with an eye to the future and to the national interest. Such profit as it made—in the tiniest minority of cases—was put back into the business for its extension, for the purchase of essential machines, tools, etc. There is not a single aeroplane firm which, as at present established and apart from the stress of war work, makes an industrial profit. Nor, be it repeated, is this the fault of the firm, whose patriotic effort in every case has been beyond the bounds of praise, but is to be solely ascribed to Government neglect in the past.

* * *

The remedy is obvious. It is either to our national interest to build up and conserve a national aircraft industry, upon whose resources the nation can draw in future times of national emergency, or not. In the latter case the industry can be taxed out of existence; should the former view prevail, one course only is possible. I speak here with a full sense of responsibility and as one who has known the aircraft industry since its first pathetic early inception, and is intimately acquainted with its present condition. To tax the industry out of existence is an easy matter by the rigid application of red tape; in so doing it will again be reduced to the level of the parasite, living upon the vicarious generosity of the seeker after notoriety or the slick advertisement agent.

* * *

As I have said, the remedy is obvious and equitable—a rare combination. More, it happens to be coincident with national interests. An aviation firm makes a profit. Let us forget the long unproductive years during which it laboured in vain, during which it failed as a commercial concern, in the sense that its balance sheet showed many a balance on the right side; but during which it laboured on at its thankless task, conscious in the rightness of its own endeavours. That firm, on an ordinary commercial basis, has made its profit. The whole of its capital, the whole of its profit, is sunk in the purchase of new machinery in order to extend its activities. What it makes it puts back into the business. Remember, it has no ordinary, legitimate trade to fall back upon. I make bold to say that there is scarcely an aviation firm in this country that, if its so-called excess profits be taxed according to schedule, will not perish miserably. After all, patriotism has its limits.

* * *

As I have said, the remedy is obvious. And the Society must see that it is obtained. Not one of us objects to the tax on excess war profits. We will willingly pay all that falls to our share. But, and all resides in that but, we must extend our works, purchase new machinery, even put something to reserve if we are to exist hereafter. Our earnest representation is, therefore, that, whereas we are willing to bear our burden, let our tax be levied, not on the moneys we put back into our business for its future development in the national interest—for on no other conditions can the industry continue to exist nowadays—but on such profits as we may realise over and above that. More explicitly still. In the days before the war Government lent us never a helping hand. But we, imbued with faith, still carried on. The same spirit animates us still. Let us return to those who shared our faith and loyally stood by us in the lean years the meagre 5 or 10 per cent. on their money, after sinking such amount as the business requires into the business itself and solely for future development. Tax us on the remainder: we shall be the last to object. The only object we have at heart is the perpetuation of the industry on a basis which, to say the least of it, will afford it a bare subsistence in the days to come.

J. H. L.

THE BITER BIT

WE most of us remember the charming old lay of the mad dog who ventured, unprovoked, to bite a human being, and how—"it was the dog that died." The less reputable political controversialist of modern times, with his narrow, circumscribed vision, with the imperative necessity that is his of scoring a point at whatever cost and by whatever methods, and of "doing it now," is apt—to put it mildly—for lack of a better weapon, to have resort to personal abuse of his opponent in argument, and thus to emulate our enraged hound. His methods are as easily recognised as they are disingenuous. The Hun has shown himself an adept in the matter. When, the accepted and honourable means of warfare having failed him, he proposed to have recourse to the employment of asphyxiating gas, he promptly, for want of a better excuse, accused his opponents of having employed this expedient. In political controversy, as in journalism, personal abuse is not unlike the use of poisonous gases in warfare. When first employed against fighters versed in the more honourable methods of war they may win a temporary advantage, since they possess the element of surprise, but a change in the wind or an awakening of public opinion is apt to send the noxious clouds swirling back, with unpleasant results, to the quarters whence they came. In no case can methods such as these in the slightest degree affect the main issue.

Personal abuse leaves me cold, the more so since it is essentially a self-imposed confession by the user of the weakness of his case. Moreover, it is to be deprecated in the strongest terms on an occasion such as the present, where vital national issues are at stake and that for the simple reason that it not only distracts attention from the main issue, but that it may induce the outside public to believe that there are serious internal dissensions among those to whom perforce it looks for guidance, since the Air Services and the industry which they are supposed to represent, and whose opinions they are deemed to voice, must necessarily remain inarticulate to all intents and purposes.

Yet in the present case I am compelled to notice—albeit with the utmost brevity—a series of personal attacks which have been launched against me, because they reflect at the same time upon the conduct of AERONAUTICS; otherwise, coming from a quarter, as they do, not wholly unversed in Whistler's gentle art, they might fitly have been left unheeded. An anonymous contributor to a contemporary makes certain specific charges against me, charges in themselves either ridiculous on their very face or easily disproved, but which with their wholesale innuendo tend to leave a vague, indefinite impression on the memory by means of the very old trick of cumulative insinuation.

Now, it will be very generally agreed that if a writer chooses to descend to the level of making personal attacks he should not only be sure of his facts, be prepared to stand by his words, but state them in unequivocal language. What, then, is one to gather of an accuser who in framing his charges qualifies them with such expressions as "possibly I am doing him an injustice, but I gather"; or, again, "if I am not mistaken"?

Let me take the material points and have done with this sorry business once and for all. A month ago I wrote an article for AERONAUTICS in which I examined and criticised Mr. Billing's (or his supporters') claims to be regarded as an expert on the administration of the Air Services, on the organisation of our aerial defence, on design and construction, and as the representative of the aviation industry, and more particularly on the methods adopted in pursuit of these aims. Since that date I have seen no reason to modify my views in this respect in any one particular. Rather have subsequent events borne them out. Last week the *Daily Chronicle*, a newspaper of standing and repute, saw fit to devote a considerable portion of its space to Mr. Billing's

career. During the course of various articles the writer or writers in question, including Mr. F. W. Lanchester, came to conclusions in regard to his public utterances and claims which were closely akin to those which I had expressed three weeks earlier. This fact seems to have struck our contemporary as extraordinary, and promptly leads it to the conclusion that there must be more in this than meets the eye. "One cannot fail," to quote its words, "to be struck by a *curious* resemblance between the article in the *Chronicle* and an article by a Mr. Ledeboer" (the italics throughout are mine). Apparently, therefore, when two presumably sane people investigate the same subject and reach a similar conclusion—and especially one that is at variance with the views held by our contemporary—the resemblance must perforce be "curious." Let me state plainly, to remove any possible misapprehension, that I neither initiated nor wrote those articles nor had anything whatever to do with them.

Point number two. "I gather," proceeds our scribe, "that he (Mr. Ledeboer) has quite understandable personal reasons for disliking Mr. Pemberton Billing, and, *therefore*, one cannot quarrel with his attack, but only with his methods." I render thanks; I could not, had I tried, have hoped more briefly and lucidly to explain the mentality of the author of those felicitous words and his attitude in public controversy. According to him, one cannot quarrel with a man who attacks a public or political opponent *because he has personal reasons for disliking him*. Is it possible to imagine a more utter travesty, a more complete reversal, of all our accepted traditions concerning public life and decency? Even a common or garden journalist, Mr. Anonymous Author, would hesitate all the more to attack an opponent for the simple reason that he disliked him personally. However, our minds thus illumined, we may proceed to the next point, though I may state in passing that, so far from having a personal dislike for Mr. Billing, understandable reasons or no, my acquaintance with that gentleman is of the slightest, and extends to, perhaps, two or three brief occasions during the last six or seven years.

Thirdly and lastly, referring to an advertisement, reproduced by the *Daily Chronicle*, wherein Mr. Billing endeavoured to sell licences to use his patents, our genial writer presumes that the advertisement in question was "taken, if I mistake not, from Mr. Ledeboer's paper." The purport of this insinuation is not clear. If it is intended to imply that the advertisement appeared in AERONAUTICS, as presumably it does, the assertion is simply false, no advertisement from Mr. Billing or his firm having ever appeared in our columns. As a matter of fact, the advertisement was reproduced from the *Aeronautical Journal*, which is and always has been the official organ of the Aeronautical Society.

Here let us leave this undignified and lamentable affair. Personal abuse is at once the easiest and the lowest form of journalism; during the whole career of AERONAUTICS it has ever been rigorously excluded from these pages, and to that attitude we shall adhere in the future as strictly as in the past and the present. Our sole concern is with principles and with facts. Where abuses exist they will be resolutely attacked; where the interests of the industry are at stake they will be upheld to the best of our ability; but the indulgence in personalities and indiscriminate invective may fitly be left to the lesser fry.

Meanwhile I would impress upon our contemporary a statement lately uttered in public. "I should have passed over all these allegations as mere personal abuse except for the charges which appear to-day. I don't object to hard hitting. I hit hard myself. But I protest that it is un-English to attempt to injure a man by insulting domestic innuendoes which are as false as they are cruel." And the words were the words of Mr. Pemberton Billing.

J. H. L.

NOTES ON THE DIMENSIONAL THEORY OF WIND TUNNEL EXPERIMENTS*

By EDGAR BUCKINGHAM, United States Bureau of Standards

(Continued from page 256)

THE CRITICAL SPEED

In the foregoing case of resistance proportional to S^2 , the plot of $\frac{R}{\rho D^2 S^2}$ as ordinate against $\frac{DS}{\nu}$ as abscissa gives, of course, a horizontal straight line for bodies of a given series. But if the experiments are carried down to smaller and smaller values of $\frac{DS}{\nu}$, a critical value may be reached where the relation ceases to hold and the character of the fluid motion changes very rapidly, though apparently not discontinuously, so that the function ψ ceases to be a constant for low values of $\frac{DS}{\nu}$. For a given body in a given medium this critical value of $\frac{DS}{\nu}$ corresponds to a critical speed Sc which may be computed *a priori* from the values of D and ν , if the critical value $\left(\frac{DS}{\nu}\right)_c$ has once been determined for bodies of the given shape by varying any one of the variables D , S , and ν , or all together. Eiffel's observations on spheres † confirm the foregoing statements when we take into consideration not merely a single speed for each diameter but the whole critical range within which the rapid change in the form of ψ occurs.

Mr. Hunsaker's observations on sharp cornered discs of different diameters, but the same thickness, are very interesting as showing the possible importance of such sharp edges or corners. The discs were not geometrically similar; but the corners at the edges were not only nearly similar but, inch for inch, very nearly identical. Accordingly, that part of the total resistance which may be regarded as due to the sharp corners at the edge reached its critical value always at about the same speed, irrespective of the diameter of the disc which was bounded by the edge. The rapid change in the total resistance near this speed seems to indicate that the "corner resistance" formed a considerable fraction of the whole.

The occurrence of a critical speed for a given body in a given attitude is paralleled by the practically much more important phenomenon of the occurrence of a critical attitude at a given speed. Just as the nature of the fluid motion and the law of resistance of a given body change rapidly at a certain critical range of speed, so there are similar rapid changes in the motion and the forces at the critical angle of attack for a given aerofoil at a given speed.

REMARKS ON THE RESISTANCE OF FLAT PLATES NORMAL TO THE WIND

From equation (8) it would appear that when R is proportional to S^2 it must also be proportional to D^2 , and yet this does not seem to be true for flat plates normal to the wind. On the contrary, while $\frac{R}{\rho D^2 S^2}$ is nearly independent of S , the results of various observers indicate that it increases somewhat as the diameter of the plate increases from a few inches to a few feet. Leaving aside the improbable supposition that this effect is only apparent and due to observational errors, the most obvious explanation is that compressibility may not be entirely negligible. If that is the explanation, equation (9) and not equation (8)

is the one to be used, and it is quite conceivable that $\phi\left(\frac{DS}{\nu}, \frac{S}{C}\right)$ might have such a form as to be independent of S without being entirely independent of D . Computations of the amount of compression to be expected at the speeds in question ‡ seem to show that the discrepancies are too large to be accounted for in this way. But it may be remarked that in some of the details of the turbulence much higher speeds may occur than the speed of the wind as a whole. Hence compression might occur locally, in some parts of the field about the body, to such an extent as to modify the flow and so affect the resistance, even though computations based on the average speed of the wind might indicate that the effects of compression could not possibly be appreciable under the given experimental conditions.

Mr. Hunsaker's observations on circular discs suggest, however, that there may be another interpretation of the effect in question which does not oblige us to have recourse to the unlikely supposition that compressibility is of importance. If, as appears from these experiments, there is a critical range of speed determined by the form of the edge and not dependent on the size of plate, it seems possible that some of the apparent discrepancies between $\frac{R}{S^2} = \text{constant}$ and $\frac{R}{D^2} = \text{variable}$ may be due to the experimental results of various observers having been influenced by such critical phenomena, which were not, however, sufficiently marked to attract attention.

To decide whether an explanation of this sort is applicable would require an experimental study of the forms of edge which have been used; for until the critical speeds for these edges—if they have any—have been investigated, it is impossible to say whether the speeds at which various experimenters have worked may have overlapped with these critical ranges. Nothing more definite can be said, at present, than that it is well to pay close attention to geometrical similarity; but it seems that a further experimental study of the resistance of flat plates, undertaken with the foregoing possibilities in mind, might lead to interesting results.

DYNAMICAL SIMILARITY

Let us suppose that we are confronted with a problem of design which requires our knowing, in advance, the head resistance, at a prescribed speed, of some body such as an airship which is too large for direct experiment. The question is, how to get the desired information from experiments on a small model which can be made at a permissible cost.

Returning to equation (9) or

$$R = \rho D^2 S^2 \phi\left(\frac{DS}{\nu}, \frac{S}{C}\right) \quad (11)$$

we notice that whatever be the form of ϕ , if its two arguments have the same values during two different experiments on geometrically similar bodies, the value of ϕ itself will be the same in both experiments. This observation leads to the notion of corresponding speeds and dynamical similarity.

Let us suppose that we require the resistance R of a body of size D at the speed S in a medium with the properties ρ , ν , C ; and that we have a model of the size D_m , which

* "Reports on Wind Tunnel Experiments in Aerodynamics," Smithsonian Collection. The first article appeared in AERONAUTICS, March 3.

† C. R. 155, p. 1597, December 30, 1912.

‡ See Bairstow and Booth: Rep. British Adv. Committee for Aeronautics. 1910-11, p. 21.

can be run in a medium with the properties ρ_m, ν_m, C_m . Then if we run the model at a speed S_m , such that

$$\frac{D_m S_m}{\nu_m} = \frac{DS}{\nu} \text{ and } \frac{S_m}{C_m} = \frac{S}{C} \quad (12)$$

and observe the resistance R_m , we know by equation (11) that

$$\frac{R}{R_m} = \frac{\rho D^2 S^2}{\rho_m D_m^2 S_m^2} \quad (13)$$

For when equations (12) are satisfied,

$$\phi\left(\frac{D_m S_m}{\nu_m}, \frac{S_m}{C_m}\right) = \phi\left(\frac{DS}{\nu}, \frac{S}{C}\right),$$

so that ϕ cancels out when we divide equation (11) for the full-sized original by the corresponding equation for the geometrically similar model. Speeds which satisfy equations (12) are "corresponding speeds," and when two geometrically similar bodies are run at corresponding speeds they are "dynamically similar."

If the speeds are low enough that compressibility may be disregarded, the value of $\frac{S}{C}$ is unimportant and the condition for corresponding speeds, which ensures dynamical similarity, is merely the first of equations (12). If we use only a single medium so that $\rho_m = \rho$ and $\nu_m = \nu$, the condition for corresponding speeds reduces to

$$\frac{S_m}{S} = \frac{D}{D_m}$$

and geometrically similar bodies will be dynamically similar if their speeds are inversely as their linear dimensions.

In practice the foregoing method of experimentation is usually unnecessary. For under ordinary working conditions the resistances of aeroplanes and their separate structural elements are so nearly proportional to the square of the speed, and the effects of compressibility are so small, that for practical purposes ϕ in equation (11) or in equation (9) may be treated as a constant and equation (10) used for computation, within any ordinary ranges of D and S . Any speeds may then be regarded as corresponding speeds, and geometrical similarity suffices by itself for dynamical similarity. If the constant K of equation (10) has been determined by experiments on any body of the given shape at any convenient speed, the same value may be used in equation (10) for computing the value of R for a different speed or a different size or both.

COMPLETE DYNAMICAL SIMILARITY

The experience with flat plates, showing that even though R is proportional to S^2 it may not be to D^2 , warns us to be cautious in assuming that equation (10) may be relied on for great accuracy when the size D changes over a very large range; and it seems possible that it may sometimes be desirable to make experiments guided by equation (11) which holds for any series of geometrically similar bodies, whatever the speeds may be.

The conditions for dynamical similarity given by equations (12) can evidently not be satisfied if we work with only a single medium; for if $\nu_m = \nu$ and $C_m = C$, we have $S_m = S$ and $D_m = D$, so that no scale reduction is possible while preserving dynamical similarity. This difficulty may, in principle, be surmounted by running the model in water if the original is to run in air. Suppose, for instance, that the original is an airship which is to run 40 miles an hour in air, and let the model be run in water at such a temperature that its kinematic viscosity is $1/15$ that of the air. We then have $\nu = 15\nu_m$ and the first of equations (12) gives us

$$15D_m S_m = DS \quad (14)$$

The second condition requires that the speed of the model shall be the same fraction of the speed of sound in water as 40 miles per hour is of the speed of sound in air. Since sound travels about four times as fast in water as in air,

the model must move at the very high rate of 160 miles per hour, or about 235 feet per second. With this condition that $S_m = 4S$, and the previous condition stated by equation (14), we have

$$D_m = \frac{1}{60} D.$$

A model to $1/60$ scale run in water will then be dynamically similar to the original in air, if it is run four times as fast. Having thus satisfied equations (12) we may use equation (13); and if we set $\rho_m = 800\rho$ we have

$$\frac{R}{R_m} = \frac{1}{800} \times 60^2 \times \left(\frac{1}{4}\right)^2 = \frac{9}{32}.$$

The resistance of the original in air will therefore be about one-quarter of the resistance of the dynamically similar $1/60$ scale model in water. How soon it will seem worth while to attempt experiments of this sort cannot be predicted, but the notion of dynamical similarity shows how the problem may be attacked.

THE PITOT TUBE

Hitherto we have let R be the total head resistance of a solid body, but if D is the diameter of the impact opening of a Pitot tube, $\frac{R}{D^2}$ may evidently be regarded as a quantity which is proportional to the impact or velocity pressure p . Hence equation (6), as applied to the Pitot tube at rest in a current of fluid, may be written

$$p = \rho S^2 \phi\left(\frac{DS}{\nu}, \frac{S}{C}, r', r'', \dots\right) \quad (15)$$

and it is interesting to compare this with the known behaviour of Pitot tubes and with the Pitot equation as ordinarily given.

In the first place, we know by experience that if the impact opening is the mouth of a long tube pointed up stream, the precise form of the tube and the shape and diameter of its mouth have no appreciable influence on the impact pressure recorded. This means not only that the shape variables r', r'', \dots , etc., are of no importance and may be omitted from among the arguments of ϕ , but also that D is likewise of no importance, so that the argument $\frac{DS}{\nu}$ in which it appears may be omitted. Equation (15) thus reduces to the form

$$p = \rho S^2 \psi\left(\frac{S}{C}\right) \quad (16)$$

When the fluid is nearly incompressible, like water, the compression caused by the impact pressure p will be so slight that it cannot affect the general behaviour of the fluid. Hence compressibility may be left out of account and ψ treated as a constant, so that we have

$$S = \text{const} \times \sqrt{\frac{p}{\rho}} \quad (17)$$

If p is measured as a head h of the liquid, we have $p = g\rho h$, and equation (17) reduces to

$$S = \text{const} \times \sqrt{gh}.$$

The value of the constant, which cannot be found by dimensional reasoning, is, in practice, $\sqrt{2}$ for a properly constructed tube.

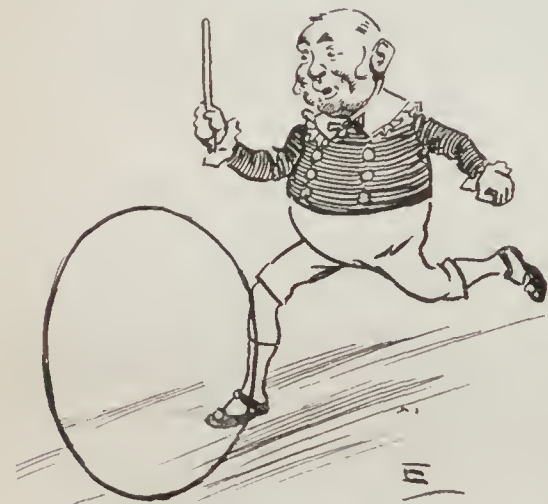
If the fluid is a gas, equation (17) is still applicable when the speed is low. But when the speed is so high that the pressure p causes appreciable compression, $\frac{S}{C}$ cannot be neglected and we must return to equation (16). A form of $\psi\left(\frac{S}{C}\right)$ for high gas speeds may readily be found from thermo-dynamics, but so many approximations and unproven assumptions have to be made in the course of the argument that the results are not at all convincing.

RANDOM REMARKS

XLV.—THE SPRINGTIME OF LIFE By ARTHUR LAWRENCE

LOOKING backwards is sometimes amusing and most often not. I am told that the aviator has but a few years of life. I don't mean that the aviator *qua* aviator is bound to die young, but simply that he is "too old at thirty" or thereabouts. Apart from exceptional cases, I suppose the "run" of a pugilist in his prime is not more than four or five years. I have not been told how much of the very best there is in the life of a journalist or of a member of any other

profession devoted to the superfine arts. Perhaps he has a spasm of only six months, his income for the rest of his life depending on "bluff." I take it that, after a certain age, what we gain in experience we lose in vitality, and that some of us are wicked enough to want to start our



naughty career all over again. It was in one of the clubs that I made a present of the retort courteous to a mere humorist. Someone asked me if I could tell him when the School Board Act came in. I said: "Oh, yes; that's easy. In 1870—the year Dickens died and I was born." I saw at once what I had done, but there was no time to "cover up." Swift came the exclamation from the third person: "What an unfortunate year for England!"

Picture the aviator in the plenitude of his might. He lifts the engine from the ground and flings it from him in the sheer joy of his strength. Undazzled, his eyes search the sun. He looketh for the four winds of Heaven and crieth out, "Thou art mine!" He heareth the noise of the battle afar off, he paweth the ground, he mocketh at fear, he toucheth the controls, and behold before thou canst count unto ten he is over the lines of the enemy. Then he scenteth his prey, he crieth "Ha, ha"; and woe is with those who dispute with him the trail of the air. Like the eagle, he mounteth up and maketh his nest on high. He dwelleth and abideth on the rock, upon the crag of the rock, and the strong place. From thence he seeketh the prey, and his eyes behold afar off. His young ones also fly, and where the slain are there is he.

But when he has passed the meridian, when he is past the age for his glorious work because he is thirty-three, what does he do? Can anyone tell me? Assuredly he does not degrade himself to assist others who are yet in their prime, nor can I picture him in the Censor's office, nor can I imagine him writing books on aeration—I mean, aviation. Perchance he retires into the country and studies the nidification of birds. In my mind's eye I perceive at the back of

his house a garden with a fountain, some dwarf trees, wide flat stones surrounding and bisecting a pond in the old English style. Here he seats himself near the new sun-dial in the gloaming and muses over the glorious deeds of his three strenuous years—too old at thirty-four. Let us hope that he is only old aviatorally. Perhaps some handsome girl has accepted the residue of his life, and there shall be children to lisp their sire's return.

It is well that his house is so well detached, for as soon as those children can toddle around there will be the twisting up of elastic, and the passer-by will run the risk of getting a model aeroplane in the eye. His daughter, when she is ten, will be an authority on rigid dynamics, and yet one can but hope that, when she is old, she will never grow flighty. The word "flapper" will have a double meaning for her. Mother will say: "You have been to Hendon six times this week. If you go again I shall speak to your father about it." And father knoweth that already a bright-eyed young man, invested like Cupid with silver wings, is already hovering around, and dear Papa hopes for the best. The pay of the R.F.C. is not high, but when they are married his daughter's picture will appear in the papers. Yet now and again as he takes his stoup of ale on the bench beneath the old beech which stands alongside "The Flying Man" he will sigh for one hour of that lusty life when at a great altitude he could faintly hear the hoarse greeting of "Archibald!" far below.

We have been told that Time flies, although, more especially when I have been waiting for unpunctual persons, who are the putrescence of the earth, I have found him travel very slowly indeed. He is not very much of a flier, but he gets there in the end. You cannot avoid him. You go to bed one night full of vim and in the morning you find that there are silver threads among the gold. I am taking more interest in absurd advertisements anent darkening the hair than I did twelve months ago. Yet I have known natures which never seemed to depart from the springtime of life. Perhaps the average aviator is blessed with that temperament. Sometimes I have felt like folding my hands together and softly singing, "Make me a child again, just for to-day," but if I found myself in a recumbent position being soundly spanked preparatory to being hurried off to school on a freezing cold morning, no doubt I should pray for the larger opportunities of later years.



PROGRESS OF AMERICAN AVIATION

By ERNEST L. JONES, American Editor

VAN BLERCK "ALL-STEEL" AERO MOTORS

A NEWCOMER in the field of aeronautical engines is the Van Blerck Motor Co., of Monroe, Mich. This concern is well-known in the marine engine field, and early in 1915 rumours were current on their entrance into the air "game."

They now offer two engines—an eight and a twelve—V-type, $4\frac{1}{2}$ in. by $5\frac{1}{2}$ in. bore and stroke. All parts are made of steel or bronze, and no aluminium or aluminium alloy enters into the construction of this motor.

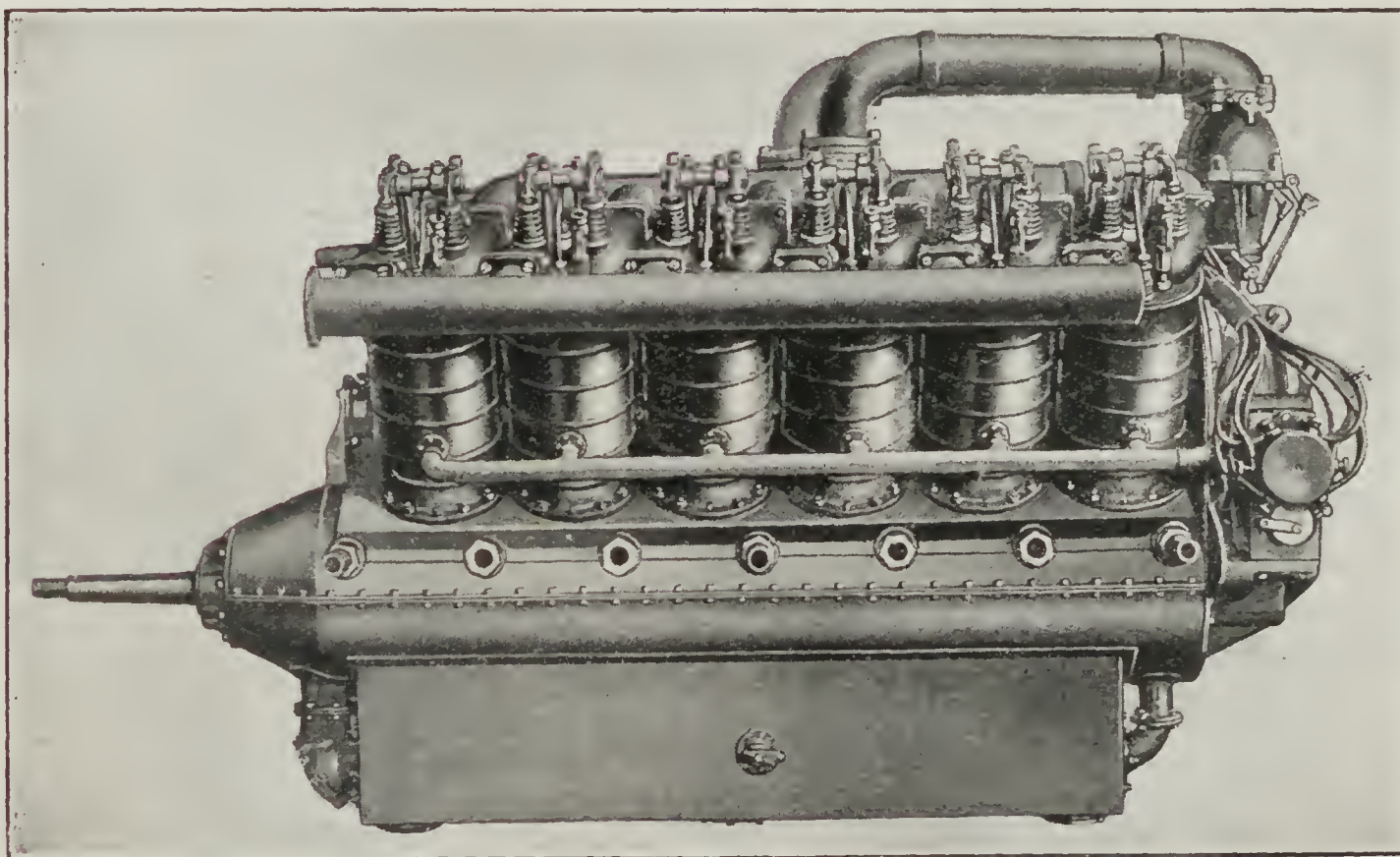
The eight-cylinder motor's power curve shows 134.5 h.p. at 1,600 r.p.m., while the A.L.A.M. rating would allot 64.8 h.p. for this motor. The larger motor develops 201 h.p. at 1,600, and the A.L.A.M. rating is just over 97 h.p. The weights run 420 lb. and 580 lb. or 3.1 and 2.9 lb. per b.h.p. respectively. This does not include propeller, radiator, water and fuel. At 1,200 r.p.m. these motors produce 110 and 184 h.p. respectively. Every motor must show as good

the usual 60 deg. V, and staggered to provide for independent connecting rod bearings on crank pins. Cylinder bore is $4\frac{1}{2}$ in. and stroke $5\frac{1}{2}$ in., giving a piston displacement of 1049.7 cubic inches. The rated power of 185 h.p. is delivered at a speed of 1,400 r.p.m. The motor weighs 600 lbs. without propeller, radiator, self-starter, lubricating oil, water and fuel.

DETAIL SPECIFICATIONS

Crank Case—Crank case is made of high-grade steel stampings. The motor supporting arms are steel tubes passing through a tubular section of the drop forged web and nut-locked in place. These tubes, three in all, extend a sufficient distance outside of crank case to permit adequate means for firmly mounting motor on supporting members of the fuselage.

Crank Shaft and Main Bearings—Crank shaft is of chrome nickel steel, drop forged and double heat-treated, machined all over and carefully balanced. Drive end is taper turned to receive propeller flange. Crank shaft is



CYLINDER VAN BLERCK AERO MOTOR

results, and each purchaser may demand a test for his own observation.

After many months of experimenting, building and re-building, testing and re-testing, after subjecting the motor to every conceivable kind of abuse, after putting it through endurance runs many times more severe than could be possible in actual service, and having found the engines stand up against it, the Van Blerck Motor Co. have placed on the market their twelve-cylinder V-type aeroplane motor that they guarantee to develop 185 h.p. at 1,400 r.p.m. So convinced are the manufacturers that this engine meets the requirements of the industry, and that it will stand up against the work to which it will be subjected, that material for five hundred complete motors has been contracted for and much of it is already delivered, consequently they are in a position to start turning out engines in quantity immediately, especially in view of the fact that they recently moved into a very much enlarged factory that enables them to manufacture motors of this type in a highly efficient manner. The following is a detailed specification of the new Van Blerck twelve-cylinder motor:

General—This model has twelve cylinders, arranged in

drilled hollow for the forced-feed lubrication system and for lightness. All bearings are of high-grade babbitt, and they are easily replaced. The upper bearings in the crank case are of the bronze shell babbitt-lined type, and they are interchangeable.

Cam Shaft—The cam shaft is of high-grade machine steel, drop forged, with cams integral, and drilled hollow for the forced-feed lubrication system and for lightness.

Gears—All gears are of nickel steel, cut from solid drop forgings and heat-treated.

Cylinders—Cylinders are forged from special high-grade steel, and with cylinder head integral. They are carefully heat-treated and accurately ground to size. Cylinders are bolted to crank case with chrome nickel studs passing through flange at lower end and securely nut-locked.

Valves—Both inlet and exhaust valves are of the mushroom type, and are made of tungsten steel. Valves and valve cages are easily removable. Operation of the valves is by means of roller push rods, ball and socket tappets, and drop forged rocker arms. Helical springs are used for both intake and exhaust valves.

Water Jackets—Water jackets are of spun copper.

Jacketing capacity is ample to ensure efficient cooling at all times.

Pistons and Rings—Pistons are of cast-iron, turned and ground to size and carefully balanced. Each piston is fitted with three concentric rings of semi-steel.

Connecting Rods—Connecting rods are of chrome nickel steel, tubular in section, drop forged, heat-treated, and carefully balanced. Crank pins end is fitted with two chrome nickel steel retaining bolts and nuts to secure the bearing cap. Piston end is fitted with bronze bushing which oscillates on wrist pin held stationary in piston.

Thrust Bearings—Thrust and radial bearings are of the ball type, with unit housing.

Oil Reservoir—Oil reservoir is of sheet steel, and is completely separated from crank case.

Oiling System—Lubrication is effected by means of a pressure system as follows:—

Oil from the reservoir is forced through a manifold to the centre main bearings by two duplex pumps submerged in the oil, one at each end of the crank case. Holes drilled in the crank shaft register with holes in bearings, and the

Water Circulating System—Water circulation is provided by a duplex centrifugal pump having two outlets, each supplying one set of cylinders. Pump capacity is ample to provide sufficient cooling water under all conditions.

Intake Manifolds—Intake manifolds are of aluminium connected to carburetter by water-jacketed intake pipes.

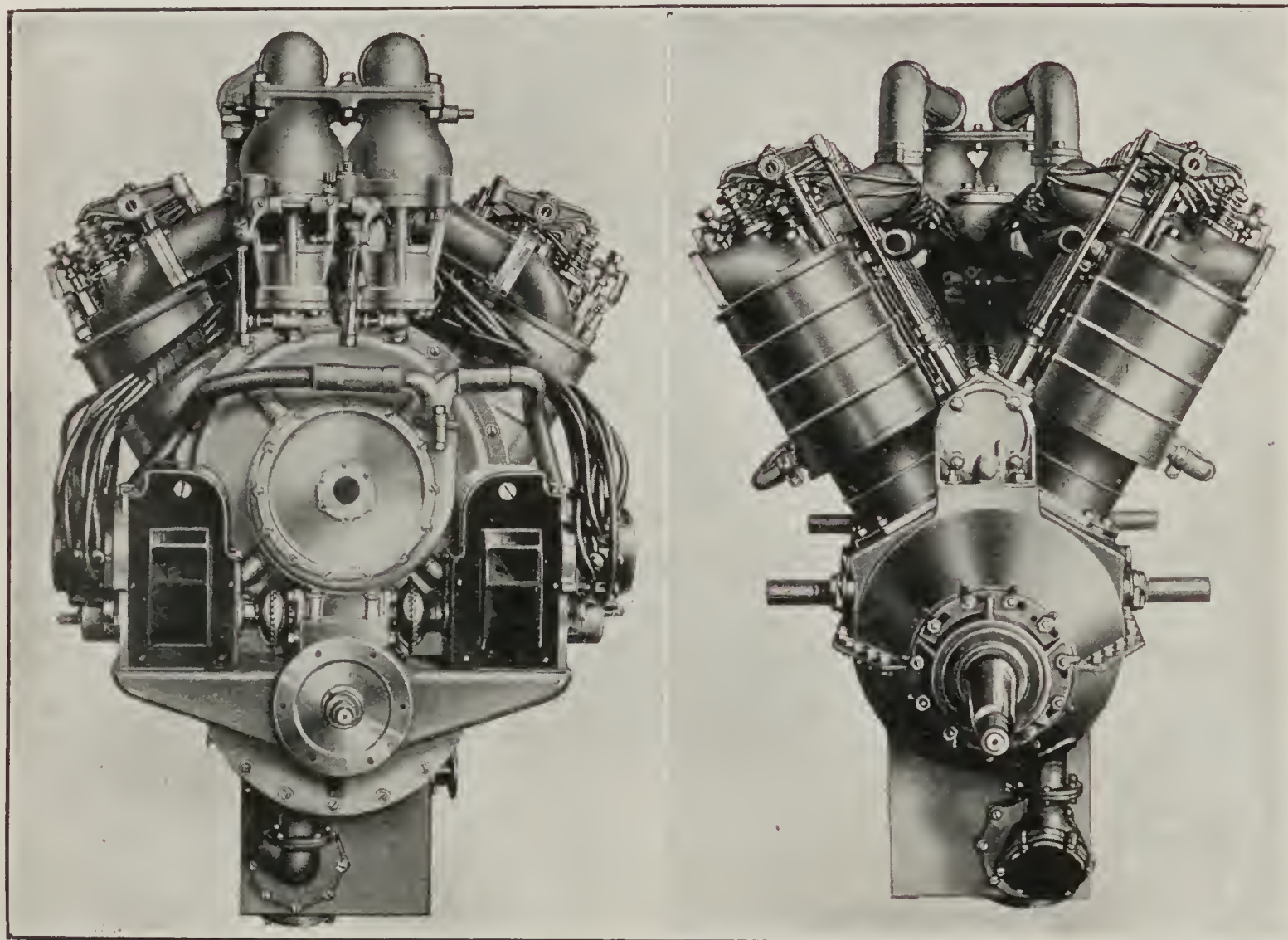
Carburetter—Carburetter is of the duplex type, designed especially for aeronautical motors.

Magneto—Two twelve-cylinder single spark magnetos are used, providing two complete ignition systems.

Spark Plugs—Each cylinder is provided with two spark plugs of an approved make.

A NEW THOMAS RECORD

THE establishment of another speed record has recently been made during the tests of the "Thomas" seaplane, type HS, ordered by the United States Navy, at Pensacola, Florida.



THE VAN BLERCK MOTOR

hollow crank shaft acting as a manifold distributes the oil to all main and crank case bearings. From the crank shaft the oil is led to the cam shaft, which has holes in it same as crank shaft, distributing the oil to the cam shaft bearings and cams. A small hole in the back of each cam acts to spray oil for lubrication of all tappets and rollers. Oil draining from the cam shaft lubricates the timing gears. Oil from all bearings drains to two sumps, one at each end of crank case, and it is forced back to the reservoir by action of the duplex pumps. The oil is then strained before being again circulated through the system. Under no circumstances will oil flood the cylinders. This system is not affected in the least by any angle of flying, and the machine can completely capsize without flooding the motor. A pressure gauge, mounted in front of aviator, indicates at all times the pressure in the system.

The high speed average made during the tests was 82 m.p.h. over a five-mile course, with and against the wind. The machine was piloted by Frank Burnside, with Lieut. Sauflly as passenger and official timer.

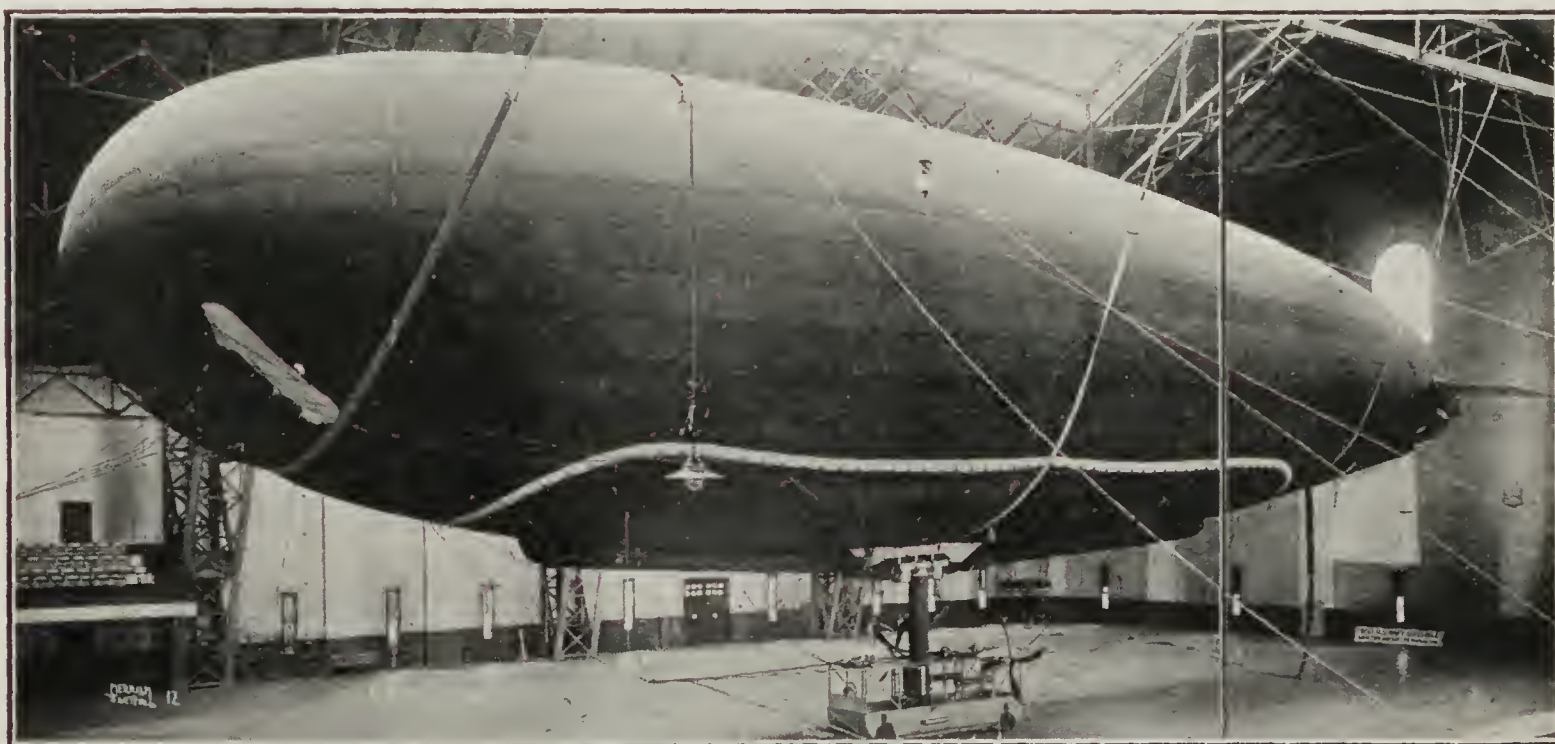
With the machine fully loaded, the climb was 450 feet per minute and the gliding angle 1 in 10.2. The results of the tests were very pleasing to the officials in charge of the Aeronautical Station. This makes two records for speed that the Thomas Company has broken this year.

CIVILIAN AVIATORS IN THE NAVY

THE House Naval Committee is at work on the Naval Appropriation Bill, part of which concerns the formation of a special flying corps to which aviators from civil life may be appointed.

NAVY AIRSHIP SAILS

NO one can dispute the fact that the toy airship delivered the end of March to the U.S. Navy can ascend. The little craft broke from its moorings on April 7 and sailed off by its lonesome for some hundred miles before it decided it had had enough of the air for its trial trip. The dirigible has the following dimensions:—Length, 175 ft.; diameter, 35 ft.; capacity, 150,000 cu. ft.; weight, 5,000 lb.; useful load, 2,000 lb. The eight-cylinder engine drives two four-bladed propellers, one on either side of the car. Vertical motion is controlled by a couple of balloonets according to the Parseval system, while the propeller axes can be rotated (a device originated in this country by E. T. Willows and later adopted by the R.A.F.) by means of a hand-wheel and worm gear, so that the thrust can be maintained parallel to the horizontal axis of the envelope. Clearly this baby dirigible is not to be regarded seriously, since at most it can only serve for training purposes.



THE U.S. NAVY'S BABY AIRSHIP: BUILT BY THE CONNECTICUT AIRCRAFT CO.

THE GENERAL AERONAUTIC COMPANY

THE General Aeronautic Co., of 110, West Fortieth Street, New York, has appointed the Duffy Motors Corporation, of 1895, Broadway, New York City, N.Y., the metropolitan distributors of its aeroplanes and its school agents.

This is the first instance of concrete arrangements having been made to sell aeroplanes and sundries on an automobile and commercial basis.

A machine is being placed on the floor of the company's sale-room for exhibition purposes.

The General Aeronautic Co. has been established several years, but has gone along very quietly—so quietly, in fact, that some prominent promoters in New York connected with one of the biggest aeroplane companies incorporated the "General Aeronautic Co. of America" without knowing that they had been forestalled in the use of the name.

The Duffy concern is agent for the "Standard" eight-cylinder car, and is prominent on Automobile Row.

\$1,000,000 FOR MILITIA

ON April 6 a Bill was urged before the House Military Affairs Committee for \$1,000,000 for aeronautics in the State Militia, out of which appropriations would be made to ten States which had asked for funds for aeronautical work. The Militia appropriations are separate and apart from the Regular army appropriations. State Militia aviators would be trained at the army aviation school.

THE HARVARD FLYING CORPS

PLANS are rapidly advancing for the establishment of an aviation camp by the Harvard Flying Corps, and the training of 100 aviators. The camp will be under the supervision of Frazier Curtis, Harvard 1898, who recently was invalided home by the French War Office after sustaining serious injuries in the French military service. Mr. Curtis has outlined a course following that at Pau, France, where he flew for the military brevet.

He learned to operate an aeroplane at Marblehead, Massachusetts, where his brother, Greely S. Curtis, is a member of the Burgess Co. Members of the Harvard Clubs of Boston and New York have promised financial aid to the movement, and the question of a site is now being discussed, a location near Boston being desired, if a suitable tract can be found.

A room for headquarters has been secured at Cambridge, and furnished with a large number of works on the theory

and practice of aviation, including studies of military flying. The co-operation of the War Department has been asked with the loan of an army officer to direct the immediate training.

The committee in charge includes Mr. Curtis, H. H. Metcalf, and W. H. Meeker. In setting forth the plans of the organisation, Mr. Curtis points out the weakness of American aerial defence, as shown in the recent events in Mexico. To-day there are less than a score of pilots in the United States Army. This fact, he said, would show the importance to the nation of the fulfilment of the Harvard Flying Corps' plan for making immediately available a total of 100 qualified military fliers. The constitution of the Corps, after stating that the subject is to build up a United States aviation organisation to compare in size and efficiency with that of France (which has 2,200 pilots trained or training), gives an outline of the plans for bringing about this result.

The co-operation of several flying concerns has already been secured, among them that of the Burgess Company, which during the coming spring is expecting to train fully a dozen Harvard men, including graduates and undergraduates.

AERO CLUB OF PENNSYLVANIA

The Aero Club of Pennsylvania had a musicale and dance at the Bellevue-Stratford on April 14 for the benefit of the Philadelphia Navy Yard Aviation School of the Aero Club of Pennsylvania, which is seeking funds to train aviators for the Naval and Land Militia. Clarke, Thomson, and Harvey W. Kays have their flying boats here. \$10,000 is asked for to build two permanent sheds and purchase a flying boat. Owners may store free of cost at this station.

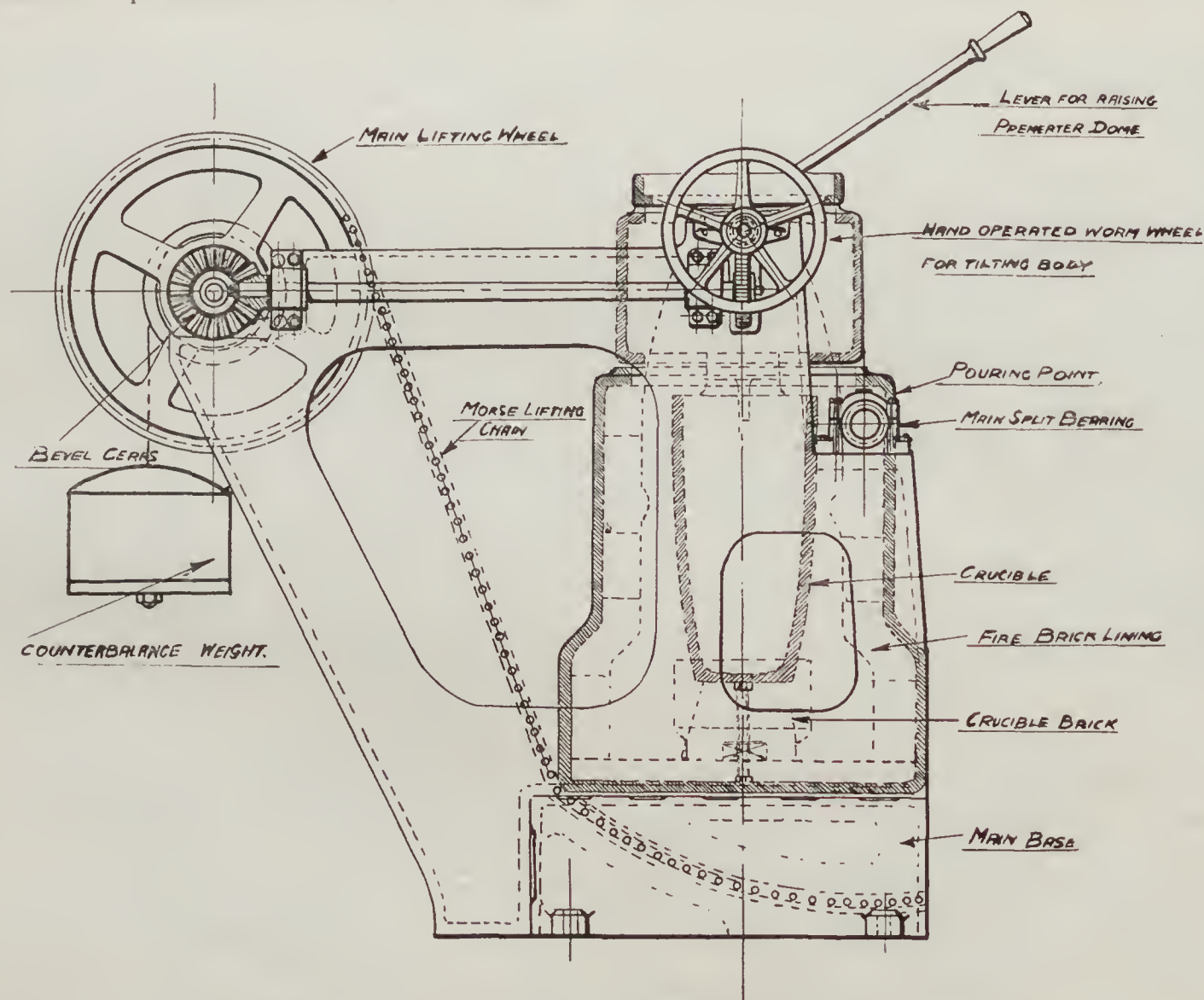
MONOMETER TILTING FURNACE

OIL and gas fuels for melting furnaces of the crucible type are considered with good reason as superior to coal or coke firing on account of the better control of the temperature, the semi-automatic method of firing and the elimination of dust and ashes, although coke is cheaper. The Monometer Manufacturing Company, Ltd., Whitehouse Street, Aston, Birmingham, have introduced many interesting and novel technical features into the manufacture of furnaces, and their latest developments form an undoubtedly interesting proposition.

The crucible melting furnaces of the tilting type illustrated are destined for oil firing, though the makers supply for gas or oil fuel, and form part of two batteries of close on thirty which we understand the firm is constructing for newly-erected works for melting copper, brass, nickel alloys, etc. The features of particular interest fall under three

pouring lip, with the result that the deviation from a strictly vertical plane of the pouring lip is only about $\frac{1}{8}$ in., and is therefore negligible. Transverse trunnions of substantial dimensions are adapted to turn in bearings fixed to the main side frames of the furnace. It may be noted here that the construction and arrangement of the furnace renders the furnace self-contained and brick setting unnecessary. The oil burner directs the oil tangentially into the combustion chamber, and is attached to the furnace body so as to move therewith. The firing operation can thus be continued during pouring.

The tilting mechanism is of correct mechanical design, and comprises a transverse tilting shaft at the back of the furnace, a toothed wheel carried on the said shaft, and a high-speed silent chain forming a connecting element of a flexible nature between the furnace body and the toothed



THE MONOMETER TILTING FURNACE

headings, the combustion chamber, the method of tilting the furnace, and the constant vertical pouring point. It will be seen from the illustration that the combustion chamber is in the form of an annular chamber concentric with but situated below the crucible, being connected to the melting chamber by inclined ducts of adequate area. The object of this combustion chamber is to delay the escape of the burnt gases and produce a simultaneous melting, and also to prevent the intense heat of combustion from concentrating at one point on the crucible, such concentration usually shortening the life of the crucible. The furnace takes standard crucibles without special spouts, and we understand that the crucible life by the monometer system is very materially enhanced. The body is $\frac{7}{8}$ in. thick, of special quality iron of a patented composition, and is extremely rigid.

The axis about which the furnace body is turned for the process of pouring is in substantial alignment with the

wheel. On the bottom of the furnace body, which, incidentally, is a substantial casting, is formed a quadrantal grooved runway, intended to accommodate the silent chain. The tilting mechanism is completed by a worm and worm wheel, a pair of bevel wheels, and an operative hand wheel. By rotating the hand wheel, the tilting shaft is turned, and the silent chain is wound on to the toothed wheel, thereby exerting a force which, through the chain, elevates or tilts the body about the axis of the trunnions. The reduction gearing has been very carefully calculated, so that a minimum effort is required to turn the hand wheel, and at the same time the tilting movement is sufficiently rapid to meet all reasonable requirements. A point which may be noted is that the toothed wheel on the tilting shaft is of sufficient diameter to accommodate the silent chain when the furnace is fully tilted, so as to prevent the chain from hanging down; thus there is no possibility of the chain slipping off the wheel. Another good point is that the tilting effort is

exerted at the bottom and centrally of the furnace body instead of the body being subjected to a twisting strain. The pre-heater is arranged to prevent access of swarf to the combustion chamber or escape of flame from the bottom of the pre-heater. The whole of the features of this furnace are patented by Mr. I. H. Hall, the managing director of the Monometer Company.

FLEXIBLE STEEL WIRE STRANDS AND CABLES FOR AIRCRAFT

THE firm of George Cradock and Co., Ltd., of Wakefield, has been noted for some years now—practically ever since the establishment of the aircraft industry—for their exceptionally high-class flexible steel wire strands and cables in connection with aeroplane and dirigible balloon construction, and rigging for aircraft generally.

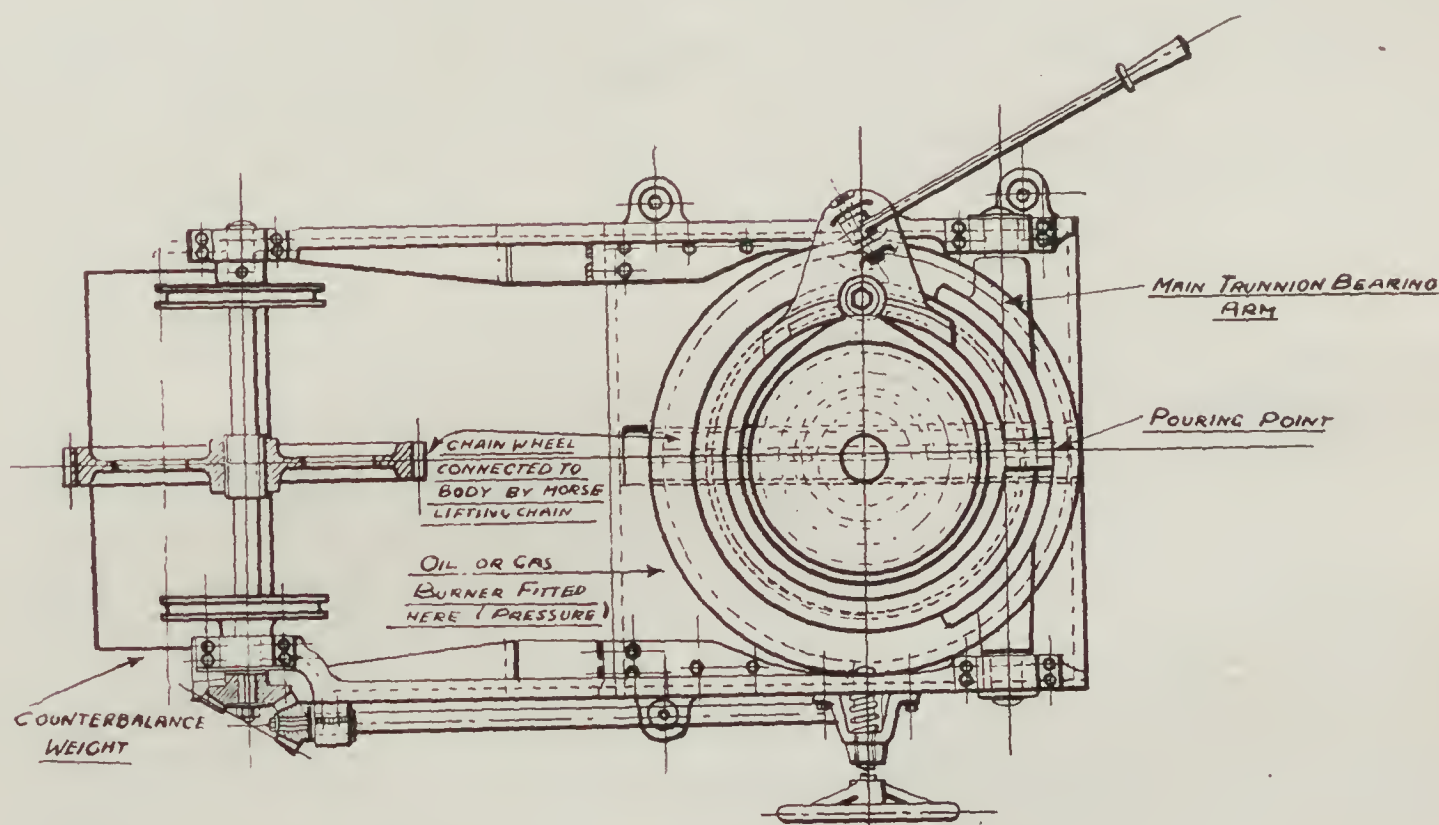
The question of strength in the cross bracing and rigging of aircraft is one of extreme importance, the com-

PROGRESS AT THE MIDLAND SCHOOL

Considerable progress has lately been made at the Billesley Aerodrome, Birmingham, where the Midland School of Flying has its being. The school, which has been entirely reorganised, is now under the direction of Horace C. Wright. Of the machines in use or nearly ready the only remaining Bleriot is a two-seater which was built by them, and its condition after several months of school work is a gratifying testimonial to their abilities in the constructional and maintenance line. It flies quite satisfactorily, with a 50-h.p. Gnome, up to the limits required for the preliminary training of pupils. Last week a Caudron was added, which is also fitted with a 50-h.p. Gnome and dual control.

The works are in King's Heath, and the construction of the school's first six Caudron type machines is well advanced, all the machining being finished while one machine is being assembled. All this batch will be fitted with dual control and Gnome motors. A fuselage tractor biplane is also being built, which will have a 60-h.p. Anzani motor, and shows promise of being a useful 'bus for advanced pupils and passenger work.

The aerodrome is now cleared of all trees and other obstructions and machines can enter low from any direction. Later on the hangar which is at present in use is to be removed to the vicinity of some permanent buildings in another corner of the aerodrome, where the firm's new housing accommodation will be erected. The Midland School through our columns tenders its excuses to the many prospective pupils it was at one time unable to accommodate, and pleads its sincere



pany, having made a special study of this matter, are especially able—owing to their sixty years of experience in the wire rope production—to manufacture the class of strands and cables most suitable for this purpose.

Steel strands and cables for aviation use must of necessity be of the highest possible quality, combining the greatest tensile strength with ductility and toughness.

This company's specialities are particularly notable for these necessary properties.

Cradocks manufacture the strands and cables (which are made of the best galvanised or tinned steel wire to Admiralty and R.A.F. specifications) entirely throughout at their works, where the steel is made, the wire drawn, and finally stranded into the various sections of ropes required.

The company are just publishing the second edition of their "Aviation Booklet," which will give full details and tables of steel wire strands composed of 7, 19, and 37 wires, with breaking strains ranging from 375 lb. to 11,715 lb., and steel wire cables composed of 49, 133, and 259 wires and with breaking strains ranging from 685 lb. to 18,230 lb.

Applications should be made to this company when in the market for this class of article, or their revised "Aviation Booklet" will be sent to all genuine applicants interested who apply mentioning AERONAUTICS.

desire to carry out its original intention to admit no more pupils than could be given the best possible attention.

Now, however, there are several vacancies and the results in prospect give promise of every satisfaction both to the school and to its present and prospective pupils. The school will be subject to a rigid working system which has been evolved, and which should obviate any avoidable occurrence of a regrettable nature; particular attention being paid to the care and maintenance of the school equipment.

LORD MONTAGU TO SPEAK AT QUEEN'S HALL

The Executive Committee of the Navy League has unanimously decided that the establishment of a Board of Aviation, with full executive powers and under the direction of a Minister with a seat in the Cabinet, has become a national necessity for the successful prosecution of the war. The League has arranged a public demonstration to be held at the Queen's Hall, Langham Place, on Friday, April 28, at 2.30. The chief speaker will be Lord Montagu, and Lord Mayors and Lord Provosts of the principal cities in the Kingdom are to be invited to be present. The Queen's Hall meeting will be followed by public meetings in the large cities. The Committee appointed by the Navy League for the promotion of a campaign on behalf of a Board of Aviation is as follows:—Mr. Robert Yerburgh (chairman), the Duke of Somerset, Mr. Wilfrid Ashley, M.P., Mr. A. Shirley Benn, M.P., Colonel Walter Faber, M.P., Mr. Rupert Gwynne, M.P., Mr. Peto, M.P., Admiral the Hon. Sir E. R. Fremantle, Admiral Sir S. Eardley-Wilmot, Mr. Arnold White, Colonel F. A. Lucas, Colonel Welby, Professor A. Bostock Hill, and Mr. V. Biscoe Tritton.

MODEL AEROPLANES—XXX

By F. J. CAMM

HAVING now completed the engine and container, it will be necessary before connecting the latter to the former to test it for leakage, and this can best be effected by immersing it in a bath of paraffin, having first inflated the container to a pressure of 100 lb. per sq. in. On no account should it be tested in water, as the impurities in this would quickly eat through the thin foil and render it quite useless.

The leaks will manifest themselves by a series of small bubbles issuing therefrom. As each leak is discovered, mark its locality with a copying-ink pencil. A leak or puncture of the most diminutive nature can interfere materially with the efficiency of the plant. They should be repaired by soldering a small circular patch of the same gauge foil over each.

The tap is most certain to prove the source of the greatest leakage; I would therefore suggest that a good price be paid for a tap with a coned valve that has been properly ground in. Although even these taps are not entirely airtight, the leakage is reduced to such a low percentage that it can safely be disregarded.

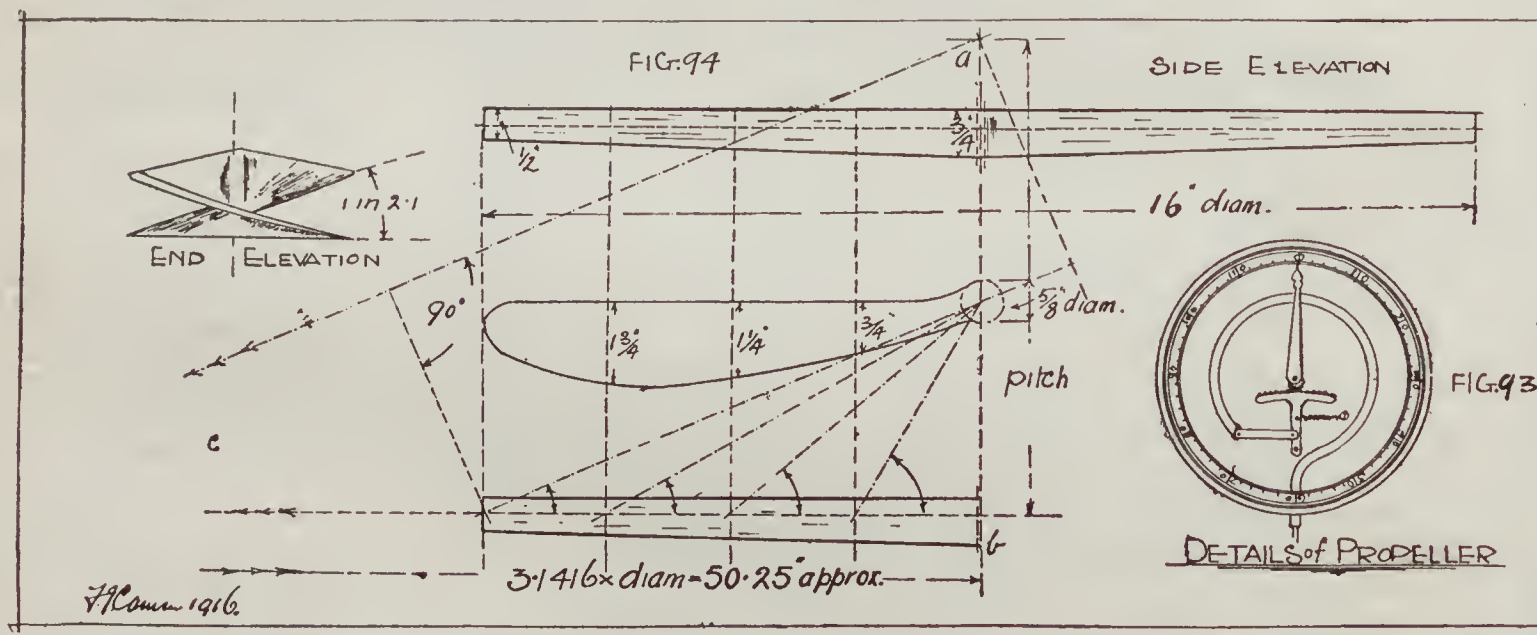
Messrs. Basset Lowke and A. W. Gamage, Ltd., supply such an article.

When all leakages are eliminated, the engine can be connected to the container by soldering one end of a short

pressure gauges, working on the principle that the tube has a tendency to straighten out when pressure is applied. The tube is made by drawing a rubber tube, which has one end sealed, over a coil of fine gauge brass wire. This latter is made by winding the wire around a length of round cross-section iron of a suitable diameter, and the area of a cross-section of the tube should be $\frac{3}{4}$ sq. in. The other end of the rubber tube is bound to the end of a piece of $\frac{1}{16}$ in. diameter copper tube, soldered for the sake of rigidity to either of the half-balls. As pressure is applied to the container, the tendency of the tube to straighten out actuates, through the connecting link, a quadrant which is in mesh with a pinion secured to the pointer arbor. The dial should be marked up to 150 lb. per sq. in.; to do this it will be necessary to note where the pointer stops when 1 lb. pressure is applied (using a foot pump with a pressure indicator attached). The weight of the complete gauge ought not to exceed $1\frac{1}{2}$ oz.

There is one other unit to be made before the plant can be given a test. I refer to the propeller.

It would be a wise expenditure of time on the part of the builder, while dealing with this interesting and highly instructive unit, to make *three* propellers of various pitches, since it is obvious that *all* the engines constructed from my illustrations will not be of equal efficiency. The propeller



length of by-pass tubing into the tap and the other into the inlet aperture of the crank-shaft, testing the soldered joints under pressure in the paraffin bath.

The question arises as to how the container pressure is to be known.

One method is to use a foot pump with a pressure indicator fixed to the base, similar to those used to inflate motor tyres. The indicator records the pressure in the pump barrel when the plunger is on the down stroke. The moment the container valve is lifted and the charge of c.a. enters, the indicator hand flies back to zero. This is the chief disadvantage of this method, as one can only ascertain the *initial* pressure placed in the container—it is not possible to note the exact fall in pressure per square inch per second, from which most valuable data could be derived.

The method favoured by the writer is to fix a small pressure gauge to the container itself. Such an article can be obtained commercially from either of the model engine dealers. Here again I would impress the importance of securing a reliable article, and hence of paying a reasonable price for it. There may possibly be some readers sufficiently skilled to construct one, and I have therefore illustrated in Fig. 93 a simple home-made pressure gauge. A bent tube is used to actuate the hand or indicator, similar to all other

here illustrated is the one found to be the most efficient upon the writer's plant, and may possibly not suit another engine.

I would suggest, therefore, that three propellers should be made, one 4 in. smaller in pitch, and the other of 4 in. greater pitch than the one here illustrated, and the results obtained with each compared.

They should for preference be cut from American white-wood, the blocks being tapered in cross-section as shown, similar to the practice adopted with full-size propellers. Carefully balance each blade so that when a shaft is passed through the hole drilled in the boss, through which the locking bolt secured in the front engine plate passes, they make an angle of 120 deg. with the axial line.

Perhaps I may be forgiven for again bringing before my readers' notice the correct method of setting out a propeller for the benefit of those readers who may not have secured that number wherein I previously dealt with this point.

Having, then, decided upon the pitch (in this case one and a half times the diameter, or 24 in.), a line is drawn vertically to a suitable scale to represent this measurement. In a horizontal direction, i.e., at an angle of 90 deg. to it, a line is laid off to the same scale, equivalent to the circum-

ference of the disc swept by the propeller—that is to say, $3'1416 \times 16 = 50'25$ in., is drawn to scale representing the distance travelled by the propeller tip in one revolution. Complete the triangle A, B, C (Fig. 94) by drawing the hypotenuse or sloping side.

By now dividing the base line into a convenient number of parts and the radius of the propeller into a similar number, and connecting the points thus determined to the apex of the triangle, the angles at the various points along the blades are found.

(To be continued)

STATEMENTS IN PARLIAMENT

HOUSE OF COMMONS

April 17—*Aviators and Prize Bounty*—Dr. Macnamara, replying to Mr. Joynson-Hicks (U., Brentford), said: The grant of prize bounty under the Naval Prize Act, 1864, is limited to such of the officers and crews of His Majesty's ships of war as are actually present at the taking or destroying of any armed ship of any of His Majesty's enemies. Legislative authority will be required for any amendment. It is the intention to extend the award to aircraft. Of course the effect of the extension would be retrospective, so as to cover any successful attack made before the legislative amendment was secured.

The Crew of "L 15"—Mr. Tennant (Berwickshire) informed Mr. Bryce that correspondents of American newspapers were permitted to interview the officers of the Zeppelin captured near the mouth of the Thames, and that such permission was granted by the War Office.

Mr. Ashley (U., Blackpool): Were similar facilities given to correspondents of English newspapers?

Mr. Tennant: I cannot say without notice.

Sir A. Markham (L., Notts, Mansfield): Is there any reason why British correspondents should not have such facilities? (Hear, hear.)

Mr. Tennant: No, sir; none.

Sir A. Markham: Why did they not have them, then?

Mr. Tennant: I am not quite sure that this will form a precedent.

April 18—*Railway Lights*—Mr. Runciman informed Mr. P. A. Harris (L., Harborough) that the experience gained by our aviators during the recent air raids clearly showed that railway signals were not visible to aircraft flying at a greater height than 3,000 ft. unless several signals were collected together on one gantry. In such cases, in localities open to the attack of aircraft, arrangements would be made to shade the lights so as to render them useless as guides to enemy airships.

April 19—*Ramsgate's Request for Aeroplanes*—Mr. Tennant, answering a question by Mr. Joynson-Hicks, said: The Mayor of Ramsgate has asked that two aeroplanes should be allowed for the protection of the town. The provision of such aeroplanes does not depend upon the willingness of the Mayor to pay for either the cost of the machines or the cost of providing the *personnel*. It depends upon considerations which it is obviously undesirable to refer to in the House or in any public place. But the hon. gentleman can rest assured that every possible step is being taken to protect the South-East Coast.

Air Pilots—Mr. Tennant, answering Mr. Billing, said: Since January 1 four air pilots have been killed or have died of injuries, and one was badly injured and has since recovered. The aeroplanes used by these officers were all eminently suited for night flying, and in no cases were the accidents due to inadequately lighted landing places. The same procedure is followed in reporting casualties at home as in publishing those which occur abroad.

Mr. Billing: Does the right hon. gentleman wish me to supply him with further evidence that accidents have happened owing to unsuitably lighted landing places?

Mr. Tennant: No, I do not wish the hon. gentleman to do anything of the kind. My information is that they have occurred from other causes.

Mr. Fenwick (L., Northumberland, Wansbeck): Have any complaints reached the right hon. gentleman from residents in the neighbourhood of those lighted stations that such lights act as a guide to the enemy when flying over their districts, and only recently very grave and serious disturbance was caused by the use of those lights? Can he see his way to order that they shall be removed from places where there is a considerable residential population?

Mr. Tennant: My right hon. friend was good enough to bring to me a complaint in the sense which he mentions. I must point out that landing places are important and room for them must be found somewhere. Of course I agree with him that it is desirable that they should be as remote as possible from thickly-populated parts of the United Kingdom, and as far as I am aware that is so. In regard to the special case which he has in view, I will have further inquiry made.

Air Defence—Mr. Asquith, replying to questions on the Air Service put by Mr. Billing and Mr. Bennett-Goldney, said: My

Having finished the carving of the propeller and glass-papered it to a smooth finish, it should be given a couple of coats of gold size (each of which should be sand-papered smooth) and a finishing coat of varnish.

It is now possible to give the motor a run. Bolt the propeller to the front plate and revolve the engine with it for a minute or two to eliminate any stiffness in the motor. Inflate the container to about 100 lb. per sq. in. pressure, and release by turning the tap. The motor should be given a few runs to wear the parts well in.

noble friend Lord Curzon, at my request, has carefully examined the whole of the aircraft situation, and as a result of that examination he has presented a report which, without disclosing its precise contents, recommends large changes in organisation. It is under consideration of the Cabinet, but I cannot say at this moment the final decision at which we shall arrive.

Casualties—Mr. Billing (Ind., Herts, E.) asked the Prime Minister whether he would now give an assurance that the terms of reference to the Committee the Government have promised to appoint would be so framed as to include both branches of the Air Service, and would the Committee be given such powers as to enable them to make effective recommendations?

Mr. Asquith: I will consider the suggestion and consult with the First Lord of the Admiralty.

The Air Services—Sir H. Dalziel (L., Kirkcaldy Burghs) said he wished to register his protest against the action of the Government in again postponing their promised statement as to the Air Services. They had been assured that they would have such a statement after the financial business was disposed of and before the adjournment for Easter, but all that they had got was a reply to a question that day informing them that the situation had been examined and a report presented, which recommended large changes in organisation and otherwise.

Mr. Billing's Position—Mr. Billing said he desired to allude to the Prime Minister's admission in answer to his question that afternoon, that the whole organisation of the Air Service was wrong and rotten and needed drastic reform. That was almost what he had admitted. The right hon. gentleman had told them that he had requested Lord Curzon to inquire into the position of the Air Services, and that his report was so intensely unsatisfactory that drastic reforms were necessary. On that he could assume that he had not come to this House in vain. It more or less justified his leaving the Service during the war.

He asked the indulgence of the House to make a personal explanation. Last week posters were covered with his name. Some of them stated it one way and some the other. The following letter which his solicitors wrote to the Admiralty would explain itself:—"Sir,—The attention of our client, Mr. Noel Pemberton Billing, M.P., has been called to a statement alleged to have been made by Mr. Edgar Charles W. Middleton to three officers of the Royal Naval Air Service, that he came down to Dover to do a bit of spying for Mr. Pemberton Billing, M.P. If any such statement was made, we are instructed by Mr. Pemberton Billing to say that there is not one word of truth therein, or in the suggestion that Mr. Middleton was authorised or in any way requested by our client to go to Dover or elsewhere 'to do a bit of spying' or obtain information for him or on his behalf. We may say that on the instructions of Mr. Pemberton Billing we have to-day issued a writ against the proprietors of the *Globe* newspaper for damages for libel contained in a placard issued yesterday containing the words 'Spying for Pemberton Billing. Airman arrested.'"

For the past three days an attempt had been made by inaccuracy and innuendo to discredit his character and to hold him up before the public as a man unworthy of credence and who claimed an authority which he was not entitled to exercise. He would have passed over all these allegations as mere personal abuse, except for the charges which appeared that day.

It was un-English to attempt to injure a man by insulting domestic innuendoes, which were as false as they were cruel. There appeared in this newspaper a direct challenge to his honour, a re-hash of the scurrilous allegations which were circulated throughout his constituency during his recent election. At that time a letter passed between a prominent Minister of the Crown and a leading party organiser, the concluding sentence of which was as follows:—"I am sorry to trouble you so much about Billing, but he has undoubtedly captured the imagination of the public. The seat is in danger, and unless we can discredit him I fear that he will be returned for East Herts." He was glad to say that the assistance which the right hon. gentleman was able to give was not successful. The writer of the letter was Sir John Boraston, and the receiver was Mr. Arthur James Balfour.

With reference to the night-flying machine which he designed, it was not until the last few weeks that the Admiralty had at last recognised the possibilities of this machine for fighting

Zeppelins by night and had eventually decided to build to his design.

With regard to Pemberton Billing, Ltd., prior to the outbreak of war for many years he had been endeavouring to foster aviation in this country at the cost of thousands of pounds. But appreciating the scarcity of pilots he thought he could serve his country better as a pilot than as a profit-making constructor. He therefore volunteered as a pilot and joined the Royal Naval Air Service and closed the factory. Later, the Admiralty decided that his factory was such that it was in the interests of the service that its facilities should be employed. It was therefore opened up and machines to his design were ordered. On deciding to enter the House he requested the Admiralty to take over the whole business at their valuation, or failing that to continue it on a 10 per cent. basis for the duration of the war, so that he need have no pecuniary interest directly or indirectly in any aerial undertakings in this country so long as he remained a member of the House. Negotiations are now in progress.

Perhaps the most serious of the newspaper accusations affect members of the Government. He had asserted, and repeated, that the hon. member for East Birmingham (Mr. Steel Maitland) stated to him in his own house that if he stood as an independent candidate the Government would have nothing to do with him, but if he was prepared to wait he would in due course be found a safe seat. So far as the name of the Colonial Secretary had been brought into this, he repeated that in a conversation which took place in the room of the Chief Liberal Whip in this House and in his presence he declared his intention to enter the House in any event, and if he could not get in in any other way to fight the joint party machine as an independent candidate on the Air Service.

Throughout the constituency that he fought, and throughout Wimbledon during the last few days, hired speakers of the party machine had said, "This man was flung out of the Air Service. He is a waster. He is no good in the House, or out of it. He has never flown an aeroplane. He has never done anything. He is a liar." Under those circumstances, he desired to read to the House a letter which his late Commander-in-Chief wrote to him on leaving the Service. The letter read as follows:—"Air Department, Admiralty, December 23, 1915. Dear Pemberton Billing,—I am sorry indeed to receive your application to retire

from the Naval Air Service, as I always considered you as one of the star turns for any air raid that might be required to be organised. Had another attack on the Zeppelin shed on Lake Constance been required, you were the man to undertake the job. In confidence, I may tell you that Mr. Churchill and Lord Fisher were very pleased with the way you organised the Lake Constance raid, and instructed me to note your name for advancement. I believe the French Government were also pleased with the bombs dropped on Zeppelin factory. If any question of your promotion arises, or any honour is suggested for your war services, I will do my best to press your claims on the authorities. With sincere regret on your decision to leave the Air Service, and with all good wishes for the future, I remain, yours very sincerely, MURRAY F. SUTER."

Mr. Steel Maitland's Denial—Mr. Steel Maitland (U., Birmingham, E.) said: I have to thank the hon. member for his courtesy in sending me word that he proposed to refer to me in the course of his statement. I do not wish to take up the time of the House for more than a very few minutes indeed to deal with the particular point mentioned by him. The hon. member stated that in a conversation with me at my house I undertook if he waited to find him a safe and comfortable seat. The hon. member met me at my house; he informed me on that occasion that he did not wish to attack the Admiralty or the Air Service. But I absolutely deny categorically that I ever either undertook or promised or gave him any expectation whatever of my finding him a safe and comfortable seat if he did not attack the Government. I am afraid that I cannot put it more plainly than I have done.

Mr. Steel Maitland, after reading a passage from a speech by Mr. Billing in which that gentleman had referred to a conversation with Mr. Bonar Law, said the Secretary of State for the Colonies absolutely adhered to his denial of the utterances attributed to him in the room of the Chief Unionist Whip, which he supposed must have been meant when the expression Chief Liberal Whip was used. He had the Secretary of State's authority to state that before making that denial he refreshed his memory by consulting the Chief Unionist Whip as to what exactly occurred.

Mr. Gulland (L., Dumfries Burghs) said the hon. member was certainly not correct in his reference to the office of the Chief Liberal Whip. He had not the pleasure of seeing the hon. member till the day he took his seat in the House.

AIRCRAFT IN ACTION

OFFICIAL INFORMATION

ENGLAND

April 17—Aeroplane Missing—Yesterday (April 16) there was considerable aerial activity. One of our machines is missing.

(See German official)

April 24—Air Raid on Dover—War Office announcement: "At 11.45 a.m. a hostile aeroplane appeared over Dover from the east and circled over the town at a height estimated to be 6,000 ft. Anti-aircraft guns at once came into action. The hostile machine was driven off. No bombs were dropped."

April 24—German Aeroplane Brought Down—A hostile aeroplane was brought down by anti-aircraft gunfire near Ploegsteert. Pilot and observer killed. One of our machines is missing.

(See German official)

April 25—Zeppelin Raid on East Coast—War Office announcement: "Three Zeppelins are reported to have come in from seawards over the Eastern Counties last night (April 24). Two crossed the coast of Norfolk shortly before 10.30 and another followed at about 11 o'clock. A few incendiary bombs have been dropped up to the time of the issue of this *communiqué*."

FRANCE

April 17—Aerial Activity—Issued by French Ministry of War: On the night of the 15-16 one of our armoured aeroplanes attacked in the North Sea, at a height of about 300 feet, an enemy ship, upon which it fired 16 shells, the majority of which hit their objective. During the night of the 16-17 one of our squadrons, consisting of nine aeroplanes, carried out, in spite of an intense mist, an important bombarding operation in the region Conflans-Pagny-Arnville-Rombach. The following bombs were thrown: Twelve on the Conflans railway station, 16 on the Rombach factories, 8 on the railway station of Arnville, and 11 on the railways of Pagny and Ars-sur-Meurthe. During the night of the 16th our bombarding aircraft dropped 22 bombs on the stations at Nantillois and Brieulles (north of Montfaucon), 15 bombs on Etain (between Verdun and Conflans) and in the bivouacs in the Forest of Spincourt, and 8 bombs on the cantonments of Viéville and Thillot—north-west of Vigneulles.

April 18—Bombs on Belfort—Issued by French Ministry of War: During the night of the 16th-17th German aeroplanes dropped seven bombs, one of which was an incendiary bomb, on Belfort. Three persons were killed and six wounded, but the material damage was of little importance.

April 22—Bombs on Enemy Camps—One of our bombarding squadrons threw twenty bombs into the enemy camps near Azannes and Villers-les-Mangiennes, north-east of Verdun.

April 24—Raid on Belgian Stations—In Belgium yesterday and last night (April 23) our air squadrons twice bombarded the station of Vyfwège, east of the Forest of Houthulst. Thirty and eighteen

bombs of heavy calibre were dropped on the station buildings during the two raids, and many of the projectiles struck the objects aimed at. All the machines returned safely.

April 24—Raid on Enemy Stations—During the night of April 23-24 our air squadrons carried out several bombardment operations. Twenty-one shells and eight incendiary bombs were dropped on the station of Longuyon, five shells on the station of Stenay, twelve shells on bivouacs to the east of Dun, and thirty-two shells on bivouacs in the Montfaucon region, and on the station of Nantillois. (The places bombed by the French air squadrons are all on the German lines of communication in the Verdun region. Stenay and Dun are on the railway running into Verdun from the north; Nantillois and Montfaucon are north of Malancourt, and Longuyon is north of Spincourt.)

ITALY

April 18—Bombs on Military Positions in Trieste—Yesterday (April 17) one of our seaplanes and three French seaplanes, escorted by our torpedo-boats, effectively bombarded important military positions near Trieste and returned safely in spite of violent enemy fire. Four Austrian seaplanes, which endeavoured to attack our torpedo-boat escort while they were returning, were counter-attacked by three Italian aeroplanes and put to flight. During the night enemy aircraft approached Venice, but were unable to carry out their raid owing to the sustained fire of our anti-aircraft batteries. One of them, a seaplane, was obliged to descend at sea, and was captured by us, the naval officer and the pilot on board being made prisoners.

(See Austrian official)

April 18—Enemy Raider brought Down—Last night (April 17) enemy seaplanes made a raid on Treviso, Motta di Livenza, and some smaller places, throwing about 30 bombs. Ten deaths are reported, and about 20 people were wounded, while damage was done to some buildings. One seaplane was brought down at Grado, and the two aviators, one of whom is an officer, were made prisoners.

April 20—Bombs on Bassano—An enemy aeroplane dropped three bombs on Bassano, but without doing any damage to life or property.

April 21—Raid on Trieste—On Thursday (April 20) a small squadron of our aviators dropped about 60 bombs on the station of Torovolanti, near Trieste. Very effective results were observed. In spite of the enemy's fire, all the machines returned safely.

(See Austrian official)

April 24—The Raid on Trieste—In reply to the Austrian charge that nine civilians, including five children, were killed by the Italian air raid on Trieste on April 21, a Rome *communiqué* says that the aviators took care to avoid the town, but threw sixty bombs on the Austrian Lloyd Dockyard to the south, where the seaplane station is, and whence so many raids upon undefended Italian towns have started.

RUSSIA

April 17—German Ruse—The enemy is using aeroplanes bearing our distinctive circles on the wings.

April 18—Austrian Raid on Czernowitz—The special correspondent of the *Morning Post*, writing from Petrograd, states: While holding a review of certain divisions his Majesty's (the Emperor Nicholas of Russia) attention and that of all present was attracted, with very mingled feelings, by a vigorous bombardment from the Russian batteries. It appears that the Austrians had sent a flotilla of aeroplanes from the neighbourhood of Czernowitz towards Chotin, and that two of these succeeded in getting past the Russian aviators and through the ring of fire opened by the Russian forward batteries. These two aeroplanes reached within four miles of the review ground—a distance which, seeing that it would take an aviator only three or four minutes to cover it, seems to have been perilously near—and dropped a number of bombs, wounding a sentry posted on one extremity of the review area. The cross-fire of the Russian batteries eventually compelled these two aeroplanes also to beat a retreat. His Majesty calmly contemplated the aerial struggle, and then resumed his progress along the ranks of the soldiery. Russian aviators took an early opportunity of visiting Czernowitz, and dropped 50 large bombs upon the railway communications there by way of retaliation for the Austrians' exploit. (The official reports of the raid were published in our issue of April 19.)

April 19—Submarine Attacked by Seaplane—In the Black Sea, one of our submarines, although attacked by an enemy aeroplane, succeeded in sinking a steamer and a sailing ship near the entrance to the Bosphorus. She was heavily fired upon by enemy batteries.

April 24—Bombs on Dowdzevas—On the Western front enemy aeroplanes dropped several bombs on Dvinsk. A Russian aeroplane of the Ilya Mouromets (Sikovsky) type dropped thirteen bombs, each weighing 40 lb., on the station of Dowdzevas, south-east of Friedrichstadt.

EGYPT

April 24—Pursuit by Aeroplanes—War Office announcement: "The General Officer Commanding-in-Chief in Egypt reports that on April 23 there was fighting in the Katia district (to the east of the Suez Canal). Aerial reconnaissance indicated that hostile parties, strength from 200 to 500, had been assembling in the desert, and were in the neighbourhood of Duweidar (fifteen miles from the Canal), and a strong attack by about 500 of the enemy was made at 5 a.m. on the post held by us at that place. The enemy was harassed during his retreat by a column of Australian troops acting in concert with aeroplanes, and suffered heavy casualties both from the fire of the troops and from bombs and machine-gun fire from the aeroplanes."

MESOPOTAMIA

April 19—Bombs on Hostile Ship—Turkish official: A seaplane which ascended from a ship off Gaza (close to the Egyptian frontier) was pursued by machine-gun fire from two of our aeroplanes, which also dropped bombs on the hostile ship.

April 20—Aerial Reconnaissance—War Office announcement relating to the Kut relief operations: Aeroplane reconnaissance after the enemy's counter-attack on the night of April 17-18 discloses the fact that a large number of Turkish ambulances were busy all day removing their casualties.

April 20—Great Expectations—Turkish official relating to the expedition for the relief of Kut.: The enemy commander, in order to avoid food difficulties, recently made the population evacuate the town. He is expecting aeroplanes to drop small bags of flour.

GERMANY

April 17—Two Enemy Machines Brought Down—Near Pervyse (Flanders) our anti-aircraft guns shot down an enemy aeroplane just behind the Belgian lines. Our artillery destroyed the aeroplane. First Lieutenant Berthold brought down his fifth aeroplane—namely, a British biplane, north-west of Péronne. The pilot was dead, and the observer was seriously wounded.

(See English official.)

April 21—Raid on Tarnopol—A German air squadron liberally pelted with bombs the railway yards at Tarnopol (in Galicia).

April 21—Enemy Aeroplane Brought Down—An enemy aeroplane fell down during the fighting at Fummin Wood, south-west of Vaux.

April 21—Attack on French Troops—Our aviators attacked places in the Vardar Valley and to the west which are occupied by French troops.

April 23—Raid on Russian Naval Base—On April 22 a squadron of ten German aeroplanes attacked the Russian air station at Papenholm on the island of Oesel at the entrance to the Gulf of Riga, and dropped forty-five bombs. Very good results were observed. A Russian aeroplane was compelled to land. All the German aeroplanes returned safely in spite of a most violent fire from the Russian anti-aircraft guns.

April 24—British Aeroplane Brought Down—A British biplane was brought down in an aerial fight east of Arras. The officers occupying the machine were captured.

(See English official)

April 24—The Zeppelin Raids on England—The following fanciful version of the Zeppelin raids on England during the period from

March 31 to April 6 has been supplied to the German Press as the official version: "The attack on the London Docks during the night of March 31–April 1 far surpassed all earlier attacks in severity and effectiveness. In the north-eastern quarter of the town numerous fires were started and serious damage was done. The district round Great Eastern-street and Great Tower-street suffered particularly heavily. In this neighbourhood a factory was also burned down. Near the Tower Bridge and London Bridge several bombs fell on a transport-steamer and severely damaged it. At Holland Park several huts and aeroplane-sheds as well as large camps, were hit. Several soldiers were killed here and various aircraft were destroyed. The London Docks and St. Catherine Docks suffered severely by the considerable havoc wrought in the adjacent workshops. About 350 workmen were unable to resume work the day after the airship attack, in consequence of the destruction of the works. Four armed merchantmen were also hit here. At the West Indian Docks several anti-aircraft guns were silenced, and in the Commercial Docks several warehouses and various small craft were destroyed. The railway was also seriously damaged, and much storage space was destroyed. Near the Tilbury Docks a warehouse was burned down and several anti-aircraft guns were damaged. At Purfleet a munition factory was hit and destroyed. At various places at the mouth of the Humber great fires were started. Near Grimsby we succeeded in destroying a barracks and in hitting a battery. In Grimsby itself widespread destruction was caused. The gasworks, the electric light works, and the suburban railway station suffered seriously. Outside Grimsby one munition factory was destroyed and another was severely damaged. Not less heavy is the damage done at the Sunderland Docks. Here, in particular, the shipbuilding yards of the firm of Swan, Swighart (*sic*), and Richardson suffered. A ship lying on the stocks fell over, and a cruiser which was ready to be launched was severely damaged. Several ships at the quays were damaged. Outside Sunderland several munition factories and sheds containing stores were completely destroyed. At Middlesbrough two large furnaces and extensive industrial works were successfully covered with bombs. In Edinburgh and Leith, too, the damage is very great. Barracks, munitions, depôts, ironworks, and other factories lie in ruins. Two munition works broke out in flames and were destroyed. The large spirit factory was hit by incendiary bombs and was burned to the ground. The railway station was also materially damaged. A train with material was destroyed. In the port several ships were hit; one English four-masted ship was almost completely destroyed, and a transport steamer with war material was so badly damaged that it could not start on its voyage. Not less was the damage suffered by places at the mouth of the Tyne. At Haxham a munition factory was destroyed, and at Newcastle a bomb hit the Tyne Bridge. Many yards and quays on both banks of the Tyne were hit. In the shipyards at Halborn and Gateshead a whole series of factories and slips have been put out of action. Above Newcastle the munition works at Ryton were destroyed. According to various reports, new ships under construction for the British Navy were also hit, but about this it is, of course, difficult to ascertain details." (This very graphic description of the raid of April 1 in no wise differs from similar German propaganda unless it is in the sudden modesty of the final sentence that the damage to warships has not been "verified.")

AUSTRIA

April 18—Raid on Trieste—Two enemy aviators flew over Trieste, dropping bombs, which killed two civilians and wounded five. The aviators were pursued by our aviators to Grado.

April 21—Raid on Trieste—Yesterday afternoon (April 20) seven Italian aeroplanes dropped 25 bombs on Trieste. Nine civilians, including five children, were killed and five injured.

(See Italian official.)

FROM OTHER SOURCES

FRANCE

April 11—Enemy Machine over Chalons—The usual Hun visited Chalons this morning and was heavily fired at with the result that it nose-dived from a great height and was presumably destroyed.

April 16—Pupils at Buc—This afternoon some hundreds of pupils ultimately destined for the French air services visited Buc aerodrome. On this occasion they witnessed the first trial flights of a new type of machine, engined with a 220 h.p. motor, developing a speed of just over 105 m.p.h., piloted by Maurice Farman. Subsequently over a score of these prospective pupils made passenger flights with Pierre Verrier.

April 18—Important Air Raids—The special correspondent of the *Morning Post* at Salonika states: "It is known here that important air expeditions were made on Sunday (April 16) by the French, with a view presumably to interfering with the arrangements made by the Germans for the offensive against Verdun and neighbourhood. As to the precise effects of these raids, nothing definite has been published, but it may be assumed, in view of the complete failure of the German offensive to carry out its objective, that they succeeded at any rate in damaging the lines of communication or disorganising the details of the German advance."

ITALY

April 24—The Col di Lana Mine Explosion—It is now permitted to publish the name of the officer responsible for the gigantic tunnel mine which recently blew up the last remaining Austrians on the Col

di Lana. The project for the work was directed by Don Gelasio Caetani, fourth son of the Duke of Sermoneta. Don Gelasio is an engineering graduate of Columbia University, and had spent thirteen years in the United States as a mining engineer. At the outbreak of the European war he wound up his affairs in San Francisco, and came home, in the autumn of 1914. He received a commission as a volunteer in the Flying Corps, but was later transferred to the Engineers, and has been in the Col di Lana region since last August. Don Gelasio Caetani on his mother's side is of English descent, the Duke of Sermoneta having married Miss Ada Constance Bootle-Wilbraham, of the family of the Earls of Lathom.

BALKANS

April 15—Bombs on Greek Steamer—Shortly after the Greek steamer *Miron*, bound for Salonika, had left the Island of Thasos yesterday two German aeroplanes approached and dropped several bombs. The vessel by steering a zigzag course succeeded in escaping into Limena Bay, Thasos, without being hit. The Greek flag was flying, and was also painted on the sides of the steamer, so that her nationality was easily distinguishable.

April 16—Bombs on Strumnitz—The enemy camps at Strumnitz and Bogdantzi, north of Ghevgeli, were bombarded to-day (April 16) by French aerial flotillas.

April 16—Salonika Fokkers—The expectation of the Athenian press of a German offensive in Macedonia seems unlikely to be fulfilled. However, I learn from Salonika on the best authority that the German air activity there is very marked indeed. The Germans recently imported a number of very small machines of remarkable speed, stated by observers to be 110 miles an hour, which generally out-distance the Allied aircraft. These machines fly low, examining the Allies' lines, often not bothering to drop bombs and trusting to their speed to save them if attacked.

April 18—British Aviators Bombard Constantinople—It is reported from Salonika that British aeroplanes resumed yesterday morning (April 17) the bombardment of Constantinople.

April 20—Three French Air Raids—It is now three nights in succession that French aircraft have been called out for raids over the enemy's ground. Following on the bombardment of Negortzi and Bogoroditza, already reported, they threw shells during the night of the 18th inst. on the barracks at Ghevgeli, and last night (April 19) bombarded the Bulgaro-German aerodrome at Negortzi, the enemy's camp near Prdeitzi, and Strumnitz railway station. Most of the bombs dropped are said to have hit the mark. All the machines that took part in these expeditions returned safely.

April 21—Raid on Sofia—A French aeroplane, detached from a squadron engaging in raiding the Bulgaro-German camps round Doiran and Petrich, last night flew to Sofia, and after discharging its bombs, returned here safely after its 350-mile journey. This is the fourth night in succession that a French raiding squadron has flown over the enemy's lines.

April 22—Raid on Sofia—According to an official telegram from Sofia, at eight o'clock yesterday morning (April 21) an enemy aeroplane coming from the south-east dropped two bombs on one of the suburbs of Sofia from a considerable height. One bomb fell on a school building and another on a small dwelling-house. The damage caused was insignificant and there was no loss of life. The aeroplane also dropped several pamphlets announcing the fall of Erzrum and Trebizond. During its return flight the aeroplane flew over the Vitosha Mountain (a range rising to 7,000 ft., south of Sofia).

(See Bulgarian Official)

April 24—Zeppelin Driven Off—On Thursday evening last (April 20) a German air squadron, including a Zeppelin, crossed the Greek frontier, going in the direction of Salonika. It was, however, forced to return by the Allies' gunfire.

April 24—Visit to Constantinople—An aeroplane belonging to the Allies has flown over Constantinople and dropped slips of paper announcing the fall of Trebizond, the death of Marshal von der Goltz, and the arrival of the Russians at Marsilles.

HONOURS FOR THE R.N.A.S.

FOREIGN DECORATION

The King has granted authority for the wearing of the following decoration, conferred by the King of Italy:—

Officer of the Order of St. Maurice and St. Lazarus
Flight Commander Lord Edward Arthur Grosvenor, R.N.A.S.

CASUALTIES

ROYAL NAVAL AIR SERVICE

KILLED

April 21

Saw, Flight Sub-Lieut. Arthur C., R.N.
Hocking, Prob. Flight Sub-Lieut. William, R.N.

SEVERELY INJURED

April 20

Douglas, Flight Sub-Lieut. Russell, R.N.

April 23

Marvin, Flight Sub-Lieut. John D., R.N.

SLIGHTLY INJURED

April 22

Marlowe, Flight Sub-Lieut. Augustine F., R.N.

April 23

Galpin, Flight Sub-Lieut. Christopher J., R.N.

ROYAL FLYING CORPS

KILLED

Undated

Lewis, Lieut.-Col. D. S., D.S.O., R.E. and R.F.C.

Lieut.-Col. Donald Swain Lewis, D.S.O., R.E. and Royal Flying Corps, was killed while flying on April 10, aged 30 years. He was the youngest son of Capt. E. Lewis, of Guildford, and received his first appointment in the Royal Engineers in December, 1904. In December, 1913, he was gazetted to the Royal Flying Corps, and was promoted captain in October, 1914. He became squadron-commander in April, 1915. He was mentioned in despatches in October, 1914, and on January 1, 1915, was awarded the D.S.O. "for valuable information repeatedly furnished to the Royal Artillery in regard to the position of the enemy's guns. His direction of our artillery fire, whilst flying, has constantly led to direct hits on the enemy's batteries and the silencing of their guns." Lieut.-Col. Lewis was married.

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED
Glen, Second Lieut. D. A., Manchester Regt. and R.F.C.

WOUNDED

Graham, Second Lieut. R. L., R.F.A., attached R.F.C.
Lock, 3053 First Class Air Mech. H. G. W., R.F.C.
Cole-Hamilton, Lieut. C. W. E., Royal Scots and R.F.C.
Donaldson, Second Lieut. E. G. E., R.F.A., attached R.F.C.
Gilbert, 7292 First Class Air Mech. W. R., R.F.C.
Russell, Second Lieut. F. G., R.F.A., attached R.F.C.

UNOFFICIALLY REPORTED KILLED

The following appeared in the obituary columns of April 17:—
COBBOLD—Lieut. Edgar Francis Wanklyn Cobbold, Cheshire Regt., Territorial Force, and R.F.C., died (injury to head) on January 12, 1916.

April 19

Scott, Second Lieut. N. D., Royal West Surrey Regt., attached R.F.C.

Second Lieut. Nigel Denniston Scott, Queen's (Royal West Surrey Regt.), attached Royal Flying Corps, who was killed while flying near Thetford on April 19, was the son of the late G. D. Scott and of Mrs. Scott, of St. Quintin Avenue, London. He was 24 years old, and received his commission last June. At the inquest at Thetford on the body of the above officer, a verdict of "Accidental death" was returned. The cause of the accident was attributed to climbing too steeply.

OFFICIALLY REPORTED MISSING AND UNOFFICIALLY REPORTED KILLED

Earle, Second Lieut. W. S., R.F.C.

PREVIOUSLY REPORTED MISSING, NOW REPORTED WOUNDED AND PRISONER

Heywood, Second Lieut. L. R., R.E. and R.F.C.

OFFICIALLY REPORTED MISSING AND UNOFFICIALLY REPORTED WOUNDED AND PRISONER

Selby, Second Lieut. C. W. P., Royal West Kent Regt., attached R.F.C.

FATAL ACCIDENT NEAR BOURNEMOUTH

Lieut. E. W. W. Rebbeck, of the Royal Flying Corps, was killed while flying near Bournemouth on April 24. He left Beaulieu, in the New Forest, early in the morning in an Army biplane, and just after 8 o'clock reached the aerodrome near Bournemouth, where he came down for a brief rest. After a halt of about a quarter of an hour he commenced his return flight, but he had only flown about a mile and a quarter when the machine turned sideways and nose-dived to the ground. The groundsmen at the aerodrome ran to the spot and found the machine wrecked and the officer lying beneath. His injuries were very serious, and he died half an hour afterwards. Lieut. Rebbeck, who was gazetted in December, 1914, and was only 19 years of age, was the son of the late Colonel Rebbeck, of Bournemouth.

APPOINTMENTS

ROYAL NAVAL AIR SERVICE

Flight Commanders to be Squadron Commanders:

H. A. Williamson and W. Briggs: April 14.

Acting Squadron Commander:

W. Briggs, promoted to Squadron Commander, with seniority of April 14.

A. H. Allardyce and S. H. Gaskell, both entered as Probationary Flight Sub-Lieut. (temp.), with seniority respectively of March 16 and April 13, and both appointed to *President*, additional, for R.N.A.S.

J. G. Bayes and A. S. Cheshire, both entered as Lieut. and Sub-Lieut. (temp.) respectively, R.N.V.R., with seniority of April 15, and appointed to *President*, additional, for R.N.A.S.

Temp. commissions as Lieut. (R.N.V.R.) have been granted to N. H. Brandon and H. L. Ratty, with seniority of April 15, and both appointed to *President*, additional, for R.N.A.S.

L. M. Bailey and I. J. Springfield entered as Probationary Flight Sub-Lieuts., for temp. service, with seniority of April 19.

Lieut. (R.N.V.R., temp.):

K. Secretan, to *President*, additional, for R.N.A.S.: May 24.

ROYAL FLYING CORPS

The following appointments are made:—

Flying Officers:

Temp. Second Lieut. (temp. Lieut.) W. St. J. Scott-Scott, from Reserve Regts. of Cavalry, and to relinquish his temp. rank; Second Lieut. E. N. Holstius, Durham Light Infantry, and to be seconded; Second Lieut. H. A. Taylor, Royal West Kent Regt., and to be seconded; Second Lieut. J. S. Windsor, South Wales Borderers, and to be seconded; Second Lieut. M. L. Maguire, Connaught Rangers, and to be seconded; Lieut. J. C. Russell, R.E., from a Flying Officer (Observer): April 1.

To be Temp. Second Lieuts. for duty with R.F.C.:

Corp. (Motor Cyclist) Arthur Harold Bowyer, from R.E., T.F.: March 19.

First Class Air Mech. James Edwards, from R.F.C.: March 26.

Serg. F. T. Courtney and Corp. O. W. Clapp, from R.F.C., to be Temp. Second Lieuts. for duty with Military Wing of that Corps: March 28.

Pte. Cecil Edward Pither, from A.S.C.; Pte. W. G. Barker, from 1st Canadian Mounted Rifle Bn.: April 2.

Pte. E. Bainbridge, from Royal Fusiliers; Serg. C. F. Reeve, from Australian Imperial Force; Serg. E. S. Williams, Winchester College O.T.C.; Pte. A. J. Court, from Australian Imperial Force; Pte. T. W. Jay, from H.A.C., T.F.; Pte. R. M. Drummond, from Australian A.M.C.; Pte. A. T. M. Grove, from 61st Canadian Infantry Bn.: April 15.

The undermentioned, from R.F.C., to be Temp. Second Lieuts. for duty with the Military Wing of that Corps:

First Class Air Mech. Raymond John Everest: March 26.

Flight Sergt. Frank Nuttall and Second Class Air Mech. Alfred Jasper Oscar Spiers: April 6.

Flying Officers (Observers):

Capt. J. A. Denistoun, 8th Canadian Infantry Bn. (90th Rifles); Temp. Lieut. R. S. McClintock, R.A., T.F.; Temp. Lieut. J. T. Milne, Oxfordshire and Buckinghamshire Light Infantry, and to be transferred to General List; Lieut. S. R. Stammers, Motor Machine Gun Service, and to be transferred to General List; Temp. Second Lieut. G. R. Moser, Argyll and Sutherland Highlanders: April 4.

Flight Commander:

Lieut. A. Graves, Dorset Fortress Engineers, R.E., T.F., from a Flying Officer, and to be temp. Capt. while so employed: April 3.

Assistant Equipment Officers, Second Lieuts., S.R.:

T. W. Tattersall and A. Ward: April 13.

Superintending Clerk W. E. Aylwin, from R.E., to be Quartermaster, with hon. rank of Lieut.: April 5.

SPECIAL RESERVE

Following Second Lieuts. (on probation) are confirmed in rank:

J. R. Frankish, R. Scott, C. T. H. Vaisey, Archibald Ward, Tom Whitaker Tattersall.

To be Second Lieuts. (on probation):

R. L. Brancker: March 27.

N. Kemsley, J. M. Drysdale, W. Roche-Kelly, J. T. Hanning, A. G. Pinkney, C. H. Vincent, C. A. R. Shum, H. F. Chapman, G. R. Travis, G. J. Harter, W. Fraser, C. E. Finlay, J. A. Cowling, A. M. Pearson, C. W. Carleton, H. R. Harker, H. R. Lumley, L. A. Tapper, G. G. Callender, C. S. Hollinghurst, J. N. Holtom, A. O. K. Wright, W. N. Spragg, P. W. Snell, K. L. Caldwell, W. K. Trollope, M. J. Fenwick, J. D. Stodart, N. G. Caridia, N. Comper, R. P. Attwood, E. M. Wright, E. B. W. Bartlett, I. B. Hart-Davies, W. E. L. Seward: April 15.

LEGAL NEWS

AN INTEREST IN AIR RAIDS

Charges of having attempted to elicit from telegraph messengers information regarding the damage by aerial bombardment and with having collected and recorded information respecting the measures of coast defence were brought against a naturalised Norwegian named Sivert Brun at a town in North-East England on April 17. The case was heard with closed doors. When the Court was reopened the Chairman of the Magistrates announced that in regard to the first charge they believed the defendant acted innocently, and he would be bound over to obey the regulations. The second charge was much more serious. On this defendant, who had been a week in custody, was fined £10, with the alternative of 25 days' imprisonment.

DOVER AIR DEFENCES

The Dover magistrates on April 20 committed Edgar Charles William Middleton, journalist and ex-naval airman, for trial at the Kent Assizes on a charge of unlawfully attempting to elicit information with respect to the movements or disposition of the Royal Naval Air Service such as might be of use to the enemy.

The proceedings were taken under the Defence of the Realm Act, and Mr. Ernest Chitty, who prosecuted for the Admiralty, repeated the statement that accused had told officers of the R.N.A.S. that he had come down to do a bit of spying for Pemberton Billing, and to get information for the *Daily Mail*, which was "running" Pemberton Billing. Mr. Chitty added that he had only evidence that the accused asked questions of two officers, but he volunteered remarks to three. Having been in the Service the accused knew perfectly well how very strict were the regulations forbidding officers to give information, and that he was leading those officers into very great peril.

Lieutenant Robert Medcalfe Spence, assistant paymaster, said he knew Middleton when he was in the Air Service at Dover. He met him on April 12 and asked him what he was doing in Dover. He replied, "I have come to Dover to do a bit of spying for Pemberton Billing." He asked Middleton what he wanted to know, and the accused replied: "He"—referring apparently to Mr. Pemberton Billing—"wants to know if the officers are still quartered about two miles away from the aerodrome and have to make the journey each meal time." The accused then asked where he would be likely to meet Flight-Lieutenant Cannon, and the witness told him that if he would come along towards the office he would be likely to meet him going to luncheon. On the way the accused gave the witness to understand there was a combination working against Captain Lambe, composed apparently of Mr. Pemberton Billing and Mr. Childcott, and Commander Sueter's name was also mentioned. Middleton said it would not take much more to have Lambe kicked out. Captain Lambe was the accused's superior officer at the time he was stationed at Dover. Middleton mentioned that he wrote for the *Daily Mail* under the name "Air Pilot."

Flight Lieutenant Ronald Portnan Cannon, R.N.A.S., said that the accused was a friend of his while he was in the Service at Dover. When they met outside the seaplane station on April 12 he asked Middleton what he was doing at Dover, and the accused replied, "I have been sent down to do a bit of spying for Pemberton Billing," or words to that effect. He made a suitable statement when Middleton told him that.

Pressed by Mr. Muir as to what this "suitable statement" was, the witness hesitated.

Mr. Chitty: If you leave out the adjective you can tell us the rest of the sentence.

The Witness: The first part of it was simply "You fool," with something in between.

Cross-examined by Mr. Muir, the witness said he was quite friendly with Middleton in the Service. The luncheon was not interrupted by the police inspector, who waited till they had finished coffee. As far as he knew Middleton had always been loyal and patriotic. He did not express a favourable opinion of Mr. Pemberton Billing to Middleton. He told him he did not like Mr. Billing's ways of going on.

Cross-examined by Mr. Chitty, the witness added that Middleton said that either Commander Sueter or Captain Lambe would have to leave the Service soon, and he expected it would be Captain Lambe, as he had no Press backing.

Flight Lieutenant Ryder Young, R.N.A.S., said Middleton told him that the more power Billing had the less would be that of Captain Lambe.

Sergeant Hugh Ashley, New Scotland Yard, stated that he found at Middleton's apartment at Woburn Place a number of documents, including an Admiralty letter dated December 15, stating that the accused had been found unsuitable for the Air Service and they regretted they must terminate his appointment as probationary flight lieutenant. There was also a letter signed by the accused apparently written to Mr. Pemberton Billing stating, "A few days ago I offered my support in your election campaign, but since that time various facts concerning your past career and present supporters have come to my knowledge and I cannot now see my way to support you." Two packets of developed films were also put in. Mr. Chitty said they were films of captive balloons and so on, and, strictly speaking, no civilian should be in possession of them. The detective officer said they also found a tape message in cipher; they had not been able to decipher it and had sent it to the Admiralty.

When the prisoner was formally charged, Mr. Muir, on his behalf, pleaded "Not Guilty" and reserved his defence. The prisoner was committed for trial at the next assizes, bail being allowed, himself in one security of £50, and another similar security.

THE NAVY LEAGUE MEETING

There is an immense demand for tickets for the public demonstration at the Queen's Hall on Friday, April 28, at which Lord Montagu of Beaulieu will deliver an important speech on aircraft policy and on the pressing need for the establishment of a Board of Aviation. The chair will be taken by Mr. Robert Yerburgh, President of the Navy League, at 2.30. Several members of both Houses of Parliament will be present on the platform. Applications for tickets, which are free, must be made to the General Secretary of the Navy League, 11, Victoria Street, S.W. Applications will be dealt with in the order in which they are received.

THE INSTITUTION OF AUTOMOBILE ENGINEERS

The next meeting of the Institution of Automobile Engineers will be held in the Hall of the Royal Society of Arts, John Street, Adelphi, W.C., on Wednesday, May 10, 1916, at 8 p.m., when Mr. L. H. Pomeroy, Wh. Ex., will read a paper entitled "The E.S.C. Standard Steel Specifications." The standard specifications for automobile steels which are now being issued by the Engineering Standards Committee were drawn up by the Steels Committee of the Institution, of which Mr. Pomeroy is chairman, and his paper will set forth the reasons of the Committee for the adoption of the steels and their application in automobile construction. The subject is one of great importance to all automobile engineers, and a very interesting meeting is anticipated. Cards of invitation may be obtained on application to the Secretary of the Institution of Automobile Engineers, 28, Victoria Street, London, S.W.

SOCIETY OF MOTOR MANUFACTURERS AND TRADERS

A meeting of the Aero Committee of the above Society was held on April 10, when there were present: Mr. H. White-Smith (in the chair), and Messrs. S. D. Begbie, R. O. Cary, F. Lamplough, F. May, Handley Page, and F. W. Shorland. In attendance, the Secretary.

Committee—A resignation was reported, and the question of further elections considered. It was agreed the Committee would be pleased to hear from members sufficiently interested in the work of the section to nominate representatives for election.

Membership Qualification and Representation—Resolved, to recommend that three representatives of aircraft manufacturers exclusively should be elected to the Council and two to the Management Committee; also that aircraft manufacturers should be eligible for ordinary membership.

The new Council elected at the recent Annual General Meeting of the Society has unanimously re-elected Mr. E. Powell as President. In the report of the proceedings for the year 1915, it was pointed out that in spite of the absence of exhibitions, trials, competitions, etc., there had been a number of meetings beyond the average. Some of these were special meetings, dealing with subjects to which the President had given personal attention, and as similar matters were likely to continue to require attention on behalf of the industry generally, the unanimous desire was expressed that Mr. Powell should consent to retain office, which in the circumstances he agreed to do. The new Vice-Presidents are Mr. A. Brown and Mr. E. Hopwood.

The S.M.M.T. Council and Management Committee—The full Council is as under, those starred being also members of the Management Committee:—

President: *E. Powell (Humber, Ltd.).

Vice-Presidents: *A. Brown (Brown Bros., Ltd.); *E. Hopwood (Wolseley Motors, Ltd.).

J. H. Adams (Belsize Motors, Ltd.); *A. R. Atkey (Agents' Section, Ltd.); R. D'Arcy Baker (Fiat Motors, Ltd.); *S. D. Begbie (Aster Engineering Co. (1913), Ltd.); F. S. Bennett (F. S. Bennett, Ltd. (Cadillac Motors, Ltd.)); *L. M. Bergin (Dunlop Rubber Co., Ltd.); W. Bond (St. Helens Cable and Rubber Co., Ltd.); A. Brampton (Brampton Bros., Ltd.); F. Churchill (J. and E. Hall, Ltd.); *D. Citroen (Minerva Motors, Ltd.); B. Coathupe (Agents' Section, Ltd.); A. Craig (Maudslay Motor Co., Ltd.); R. Dennis (Dennis Bros. (1913), Ltd.); S. F. Edge (Past President); *A. Goodwin (C. A. Vandervell and Co., Ltd.); E. W. Hatfield (Agents' Section, Ltd.); G. F. Heath (Agents' Section, Ltd.); *H. M. Hobson (H. M. Hobson, Ltd.); W. M. Iliff (Sunbeam Motor Car Co., Ltd.); *E. M. C. Instone (Daimler Co., Ltd.); E. Manville (Past President); H. Johnson (Joseph Lucas, Ltd.); *F. Lanchester (Lanchester Motor Co., Ltd.); J. C. Lees (Chas. Macintosh and Co., Ltd.); *W. M. Letts (Crossley Motors, Ltd.); C. Marston (John Marston, Ltd.); *J. Maughfling (John I. Thornycroft and Co., Ltd.); F. May (Green Engine Co., Ltd.); *A. S. Mays-Smith (Delaunay Belleville Automobiles (England), Ltd.); *F. Maythorn (Maythorn and Son, Ltd.); *A. N. Mobbs (Agents' Section, Ltd.); S. Norris (Agents' Section, Ltd.); P. L. D. Perry (Ford Motor Co. (England), Ltd.); *T. C. Pullinger (Arrol-Johnston, Ltd.); J. J. Rawlings (Agents' Section, Ltd.); J. Graham Reece (J. Blake and Co.); *F. W. Shorland (Clément Talbot, Ltd.); H. White-Smith (British and Colonial Aeroplane Co., Ltd.); *H. Smith (Rover Co., Ltd.); S. Straker (Past President); *H. C. B. Underdown (Commercial Cars, Ltd.); H. T. Vane (D. Napier and Son, Ltd.); L. Walton (Vauxhall Motors, Ltd.); Rowland Winn (Agents' Section, Ltd.); G. H. Woods (British Westinghouse Electric and Manufacturing Co., Ltd.); T. H. Woollen (Palmer Tyre, Ltd.); W. Peto (Peto and Radford, Ltd.).

PATENT INFORMATION

This list is specially compiled for AERONAUTICS by Messrs. Rayner and Co., Registered Patent Agents, of 5, Chancery Lane, London, from whom all information relating to Patents, Designs, Trade Marks, etc., can be obtained gratuitously.

LATEST PATENT APPLICATIONS

4,778 H. M. Carter. Aircraft. 31/3/16.

4,491 J. A. Chew. Mountings of anti-aircraft guns. 27/3/16.

4,607 H. S. Peck. Aerial dart bombs. 29/3/16.
4,517 J. Robson. Aeroplanes. 27/3/16.
4,737 C. J. Tozer. Aeroplane. 31/3/16.
4,871 Bowden Wire, Ltd. Device for releasing bombs, etc., from flying machines. 3/4/16.
5,041 W. J. Fisher. Aerial bombs. 6/4/16.
5,141 J. B. Passat. Aeroplane and motor-car wheels. 7/4/16.

SPECIFICATIONS ACCEPTED

3,939 Dodman. Airships and hydro-airships.

SPECIFICATIONS ACCEPTED THIS WEEK

10,473 Martin. Aeroplanes.

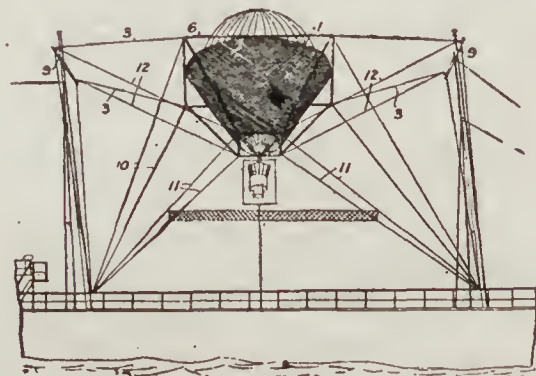
SPECIFICATIONS PUBLISHED THIS WEEK

3,939 Dodman. Airships and hydro-airships.

10,660 Masters. Aeroplanes.

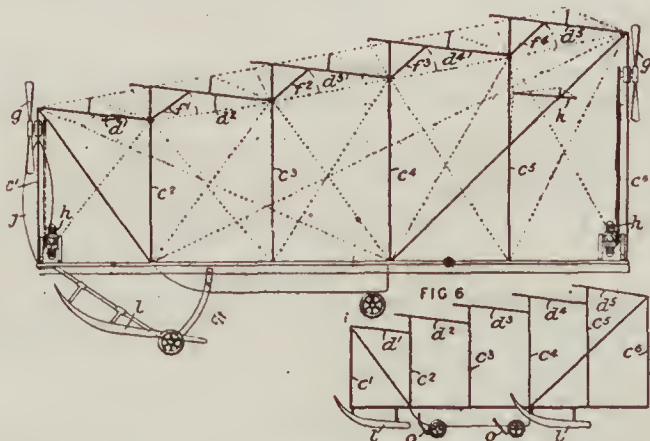
LATEST PUBLISHED ABSTRACTS

23,679 "Aeronautics." E. R. Calthrop. Eldon Street House, Eldon Street, London. A captive balloon, particularly for use with patrol ships, is housed in a nest slung between two masts of the vessel by cords, so that the nest may be raised or lowered from the deck or canted in



any direction from the perpendicular. The balloon is provided with a conical cover protecting the lower part of the gas-bag. In one form, the frame, 6, of the nest, 1, is suspended by cables, 3, 12, passing over spars, 9, on the masts to the winding-drums. Cables, 10, 11, are used to cant the nest in the desired direction.

24,084 "Aeronautics." S. W. Gillett, 17, St. Ann's Square, Manchester. The supporting planes d^1 d^5 of an aeroplane are arranged stepwise, rising from front to rear, and are fixed to the uprights c^1 c^6 at an inclination of about 12 degrees. The machine is driven by two propellers g at each end, each driven by a separate motor h .



A rudder j and an elevator k are arranged as shown. Hinged flaps f^1 f^4 are mounted at the rear of the planes so that when the machine falls they are moved upwards to close the space between the planes and convert the machine into a parachute. The machine is supported on wheels and floats l as shown. Inclined plates o , Fig. 6, may be arranged in front of the wheels to minimise their resistance when on water.

Full copies of the specification can be obtained from Messrs. Rayner and Co., at the price of 1s.

COMPANY NEWS

BLERIOT MFG. AIRCRAFT CO., LTD., 49, Old Bond Street, W.—Claims to H. de Vaux Brougham, 33, Carey Street, W.C., by May 2.

CHANGE OF ADDRESS—The address of the Aviation Department of Vickers, Ltd., is as follows:—Vickers, Ltd., Aviation Department, Imperial Court, Basil Street, Knightsbridge, S.W., where all communications should be sent.

A. E. JONES, LTD.—The well-known model makers, Messrs. J. Bonn and Co., Ltd., have changed their name to A. E. Jones, Ltd. The business will be carried on at 97, New Oxford Street, under the same management as heretofore.

AERONAUTICS

A WEEKLY JOURNAL DEVOTED TO THE TECHNIQUE OF AERONAUTICS

(FOUNDED 1907)

Edited by JOHN H. LEDEBOER, B.A., A.F.Ae.S.

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MAY 3, 1916

[Registered at the G.P.O.]
as a Newspaper

ONE PENNY

THE INDUSTRY, THE STATE, AND THE ROYAL AIRCRAFT FACTORY—II.

WE have taken the Society of British Aircraft Constructors as marking at once the beginning and the end of a definite era in the history of the British aviation industry. In other words, the industry no longer exists on sufferance as the pap-fed step-child of Government departments with all their *cohue* of interested hangers-on and bottle-washers. It has carved out an independent life for itself and means to live it. We have dealt already with two aspects of the problem: the internal constitution and politics—if the word be permitted in these latter days—of the new society, which we regard as the microcosm of the industry at large, and with its dubious relations with the tax-gatherer. We have, let us trust, made it clear—a fact self-evident to any thinking person acquainted with the facts of the case—that the industry cannot subsist, more even, can never prove a future reservoir for the aerial needs of the country, if its so-called profits—profits which in the vast majority of cases are thrown back into the business for the provision of more material—are taxed to the hilt.

* * *

We have pleaded for lenient treatment, for treatment in strict consonance with the laws of equity and with the dictates of expediency. The creation and subsequent continuation of an efficient national air industry are possible on one ground alone, for reasons fully entered into heretofore: the industry is prepared to pay its full share of war taxation, oblivious even of previous neglect, subject to one proviso, dictated solely by national interests. Let us state it clearly once again: the war found the aviation industry in a precarious state and one commercially impossible. Patriotism and the driving powers of aerial adventure and conquest, the sensing of national danger, alone compelled it to the heavy sacrifice of carrying on. Those times are past, and the future of international trade is dawning, when the best shall prevail on their own merits. We ask, as a trade, for no subsidies from the State; we have done our bit and more; we but demand the recognition of our just claims. We have laboured, spent our time, effort and money—and some of us devoted the best years of our life—to the furtherance of the great cause of aviation.

* * *

We have saved—and here I voice the industry inarticulate—the aerial present and future of the country; we saved it at Mons (about that there can be no dispute, since it is inscribed in the annals of military history); we saved it at the Marne and at the tragic episode of Neuve Chapelle. And now we demand our free right to work for the aerial salvation of Britain. The money, sparse at that and doled out with a halting hand, the money we have made after long years of waiting and vain effort, the money we want to put back into our business and our factories with the sole purpose of building up the national *military and naval* industry of the future, that money which we have earned

by self-abnegation and self-sacrifice, those meagre profits must be free. Tax us on the rest, and we will not complain. But if the war has shown anything it has proved our lamentable weakness and inefficiency in the organisation of the production of war material and of aircraft in chief. That state of affairs must not be allowed to continue or to be perpetuated in the future lax times of peace, when the politician will again come into his own and raucously rule the land.

* * *

Plainly, the industry has made sacrifices such as the commercial mind is incapable of even grasping. In the old days of Brooklands, those men who were the pioneers and are the great managers of our world-famous industrial aircraft production organisations to-day, used to sleep in their sheds, in bunks provided beneath the eaves, in order to save expense, and their hotel bill went eventually to pay for a new machine tool. One could name them, too, were the task not invidious. You will find them, or some of them, in the long list of prosperous members of the new Society of Aircraft Constructors. They have given their life-blood for the cause, but with never a word of recognition. They achieved much, albeit unhonoured, for the true history of aviation still remains to be written. A doleful lamentation over glories that are past, you may say. True enough; but also a pæan of victory. And it behoves us nowadays when we are coming into our own to pay some slight tribute of respect and acknowledgment to the unceasing labour and great-souled effort of those who went before and laid the foundation.

* * *

The main point is this. All this self-sacrifice and endeavour must not only not go without its reward, although the pioneers of the industry hope for none save for the undying approbation and veneration of their successors, but the life of the industry itself must be safeguarded. As an elemental economic axiom, an industry that is mainly a purveyor of war material, and essential material at that, that is an integral factor in the future of our national defence, and even existence, must, if not subsidised, at least be given fair play, a free hand to develop and the liberty to extend its productive powers and organisation in utilising for its own and future national resources and demands any surplus or portion thereof of the profits it has made by putting this back into its own business. Speaking with the utmost deliberation, I state without hesitation or reservation that unless this step is taken by the Government the aviation industry of this country will be ruined to all intents and purposes, and the outbreak of another war, with its instant demand for new supplies of aircraft, will find the industry in a more parlous condition than that in which it existed on sufferance a couple of years ago.

Remains the relations of the British aircraft industry as represented by the new Society with Government establishments, of which the Royal Aircraft Factory is the chief. In this particular connection much vituperation has unfortunately obscured the issue, and, more unfortunately still, has given into the hands of this Government-controlled establishment a broom wherewith to belabour the industry both in Parliament and in the Press. Let us make the position plain once and for all, and give final tongue to the attitude of the industry *vis-à-vis* to the R.A.F.

* * *

In principle no one in his senses objects to the existence of the factory. Its designation may be an unfortunate misnomer, but its functions are plain. It was established—or, rather, converted to its present status from the old balloon factory—for the purpose of forming a centre for the supply of spare parts and for building and testing new experimental machines. With the lapse of time the former function disappeared and a different organisation took its place. We have only to deal with the latter portion of its activity, and the one for the express purpose of which it was, under the changed conditions, solely established. At its back, and at its beck and call, the R.A.F. had the experimental laboratory and staff of the National Physical Laboratory, which is under the direct ægis not of Government, but of the Royal Society. It had, moreover, the governmental Advisory Committee on Aeronautics, which, apparently, is still one of those nondescript bodies possessing no executive powers of any sort or kind. You see the gorgeous muddle. The head of the whole tangle ends, so far as an ordinary mortal can tell, in the responsibility of the Prime Minister. But through what devious ways! And, of course, Mr. Asquith is an acknowledged authority on the line-squared law and the tendency to spinning engendered by misplaced keel surface!

* * *

The point is this: The Royal Aircraft Factory is, so long as aviation remains, largely an appurtenance of one or both Air Services and an integral part of national defence, an essential portion of our aerial organisation. Its function is practical experiment, regardless of cost, on a scale and with an attention to every phase of detail which is simply impossible to the private manufacturer. As I have said, at the back of it stands the N.P.L. and its qualified staff of

(To be continued)

experimenters, and the collective scientific intellect of the Advisory Committee.

* * *

So far, so good. But now comes the evil of the scheme. Two utterly distinct points are to be observed. First, the R.A.F. set itself to manufacture machines of its own design, representative of a high degree of technical excellence and structural soundness, in bulk, and thereby set itself up as an illegitimate competitor with the private aircraft industry. That proceeding has often been denied in Parliament; nevertheless, I say from absolute knowledge of the case that the statement is strictly true.

* * *

What of it? you may ask. Whatever the methods, however great the transgression, the result in the end was substantially the same—the supply of our forces in the field with the material they required. The assumption is false. Moreover, the R.A.F., both by its usurped and illegitimate functions and the thralldom it imposed by virtue of its special privileged position on the private industry, not only retarded British aviation design and constructional methods by imposing its autocratic will on the industry, stifling individual effort, but—and here lies the gravamen of the charge—specified with all the governmental authority at its back, and compelled the private industry to produce according to its specifications, a design of machine which it was impossible to manufacture industrially and conscientiously at a profit, and that to the exclusion of a firm's own designs, a firm in existence probably years before the R.A.F. was even adumbrated. The point is a difficult one and delicate. More, if it is to be brought home in all its plenitude, it demands chapter and verse for all its details. These must be reserved for next week, since the issue is of vital importance and requires final settlement before many weeks elapse. If a definite reorganisation of our air services and organisation is impending it must be done once and for all on the right lines. Let me conclude with a sentence excised from an article I wrote for these pages over two years ago: "And athwart these scattered, isolated squadrons straddles the giant shape of the Royal Aircraft Factory, supposedly their servant, in fact their overlord and supreme autocrat. In this country we have the makings of as fine and flourishing an industry as any that exists in the world . . . their views never filter through to the factory, and even if they did would not be heeded by our lordly autocrats."

AERONAUTICAL RESEARCH DURING AND AFTER THE WAR

By HERBERT CHATLEY, D.Sc. (Engineer)

A FACT not always realised by would-be inventors is that scarcely any device can be brought to a practical stage without a comparatively long period of experiment and improvement. The conception, which so frequently appears in pseudo-scientific fiction, of a brand-new type of flying machine, which takes the field to-day and is omnipotent to-morrow, is almost impossible in real life. There is very little probability that any really novel machine will appear during the war unless the duration of the war proves very much greater than is anticipated even by pessimists.

Apart from the mere time required for the development of a new type of machine, there is also the adverse factor that the brains of the movement are all concentrated on the production and differential improvement of the present types. Those who have the opportunity for aeronautical research would probably be well advised to confine their attention to perfecting the aeroplane. In this direction the following problems suggest themselves:—

1. The various dynamic problems given by Bryan in his book on stability. There is enough work in these to keep any academically minded person busy until the war is over, even if it lasts a long time.

2. Structural problems in connection with the parts of and the whole of the aeroplane. Analysis and experiment have ample scope here.

3. Engine and power problems, including propeller design.

There will, of course, be some perverse persons who cannot restrain their overflowing talents, and insist on trying a new line. There is a sporting chance that one of these may hit on something good, although the probabilities are strongly against it. To these people it may be useful to remark that the helicoptere and ornithopter are not by any means wholly discredited. In both cases the most important question of stability has not been properly investigated, and in regard to the latter there is practically no information available as to the wing reactions when an oscillatory motion is combined with translation. "Feathering," "fluid inertia effects," the relation of the lift of a vertical tractor to horizontal velocity, the mean lift of an oscillating wing, and the propulsive value of wings are all subjects which have been merely scratched. Experiment along these lines is necessary, but it is an economic question whether these things should be investigated now or after the war.

FROM ALL QUARTERS

WORLD'S HEIGHT RECORD

ON Wednesday, April 26, Harry G. Hawker, starting from Brooklands on a 110 h.p. Clerget-engined Sopwith two-seater biplane, beat the official world's height record by attaining an altitude of 7,200 metres, or 23,600 ft. approximately. The barogram has been submitted to the Royal Aero Club and will be properly checked; hence the figures given must be regarded as a provisional estimate. Hawker thereby beats his own British record of 18,393 ft. which he made on a Sopwith scout at Hendon last June, and the previous official world's record of 22,171 ft. set up by E. Audemars in France on September 8 last year. Strictly speaking, the height record, though unofficial, stands to the credit of one Oelerich, who on July 14, 1914, attained a height of 26,200 ft. in Germany, flying a 120 h.p. Beardmore D.F.W. biplane, but for obvious reasons this record never received official sanction and is not likely to.

Hawker's achievement reflects the more credit on himself and on the Sopwith firm since the machine he flew was simply taken from stock, and neither pilot nor his mount underwent any special preparations. The cold, of course, was intense,

done ere now—that these Fokkers, both of which are of the latest 1916 type, are almost identical with the machine which we fully described in these columns last January. They are still copies of the Morane, driven by a 100 h.p. Oberwesel rotary motor, which is a replica of the Gnome. The span is slightly less than was formerly the case; in fact, the whole machine is more compact. The span measures 34 ft. 1 in., and the length o.a. 23 ft. 8 in. The main petrol tank, it should be noted, is behind the pilot's seat and a small service tank in front. The fuselage weighs just 400 lb., the wings 145 lb., and the propeller (a Reschke in the case of the machine captured by us) 37 lb., giving a total weight of 582 lb. for the machine without the engine or armament.

The machine-gun is fired through the propeller by means of a small lever actuating a Bowden wire. Provision is further made to throw the machine-gun mechanism momentarily out of gear as each whirling propeller blade comes into line with the muzzle. This is done very simply by means of a double cam fixed on the engine shaft and acting on a system of levers.



THE THOMAS SEAPLANE WHICH RECENTLY BROKE THE SPEED RECORD

but Hawker experienced no difficulty in breathing but only a sensation of extreme lassitude which rendered the slightest exertion or movement almost impossible, and it was this reason alone which eventually compelled him to descend. He landed some sixty miles from Brooklands, whither he returned later on none the worse for his experience save for slightly frost-bitten fingers. The ascent took approximately one and a half hours. It should be observed that all previous altitude records were made with the aid of oxygen, while Hawker carried no special appliances whatsoever. Our congratulations to all concerned.

TWO CAPTURED FOKKERS

TWO Fokkers which were recently forced to land, one behind our lines near Amiens and the other in France not far from Châlons, were captured entirely undamaged. In view of the grotesquely exaggerated statements and the dismal ululations of the worse informed section of the Press and of sundry politicians, it may be well to assure the public—as the military authorities might with advantage have

We are cordially in agreement with our contemporary, *l'Aérophile*, to whom we are indebted for these details, in urging the authorities, if there is some objection to exhibiting captured machines in public—an objection which appears wholly unreasonable on every conceivable ground—at least to afford our constructors and pilots and all directly concerned with aviation an opportunity for inspecting these and other machines. Not only are they war trophies, but they are the living embodiment of the present state of German aviation, and their exhibition would, apart from the technical interest involved, once and for all put a stop to outcries of the "Fokker-fodder" variety.

OUR LOST SUPREMACY

Extract from a letter from a R.F.C. pilot on active flying service in France, not in Westminster: "Am having quite an excellent time out here. I am certain that those who say we have lost our supremacy in the air are totally ignorant of the inside of things."

ZEPPELIN WEATHER FALLACIES

By CHARLES VIDAL DIEHL, Director of the Newspaper Weather Bureau

"WHEN the damage is done every one is wise" is an old Spanish proverb which may be applied to the multitude of minds which have expressed their knowledge that the Zeppelin raids would happen as they have—after the events, of course. Tyros in meteorology have filled columns of more or less popular halfpenny newspapers with reasons of their own construction why under these or those climatic conditions it would be certain, or it would be impossible, for a Zeppelin raid on England to take place. I have no apology to make for them beyond that if they must write about the weather for a living, they are quite justified in limiting their forecasts to what has gone and in refusing to say what may be expected. In the few isolated instances where a forward peep has been attempted, even in suitably equivocal terms, the outcome has only been disastrous. Since raids have mostly occurred around the periods of the new moon and with a high pressure of the atmosphere, a lunar and barometric diagram-making madness has spread across the pages of the illustrated magazines. All this absurdity has arisen from an overwhelming desire on the part of the populace to have some notion of when raids may be expected. Editors of papers try to satisfy any demand which arises. Not being permitted to use genuine forecasts, their only refuge has been backcasts, which are glossed with a semblance of the real article.

More Frequent Raids

Any meteorologist attempting a sane review of the possibilities of Zeppelin raids in a general way is under the disadvantage of not knowing with any degree of certainty what recent improvements in the construction of the airships, particularly with regard to rigidity, have been made. I can judge only from what I am told by those who make a special study of the subject, and the effect of my information is that the percentage of days on which our natural climatic defence would operate successfully has been reduced by at least 10 per cent. during the past few months. Should the determination of the Huns to pursue their indiscriminate bomb-dropping in England and Scotland continue, there is no reason why, apart from the destruction of the Zeppelins by acts of war on our part, the raids should not be attempted more frequently.

Lunar Frenzy

Observers of the phases of the moon, whether resident inside or outside of asylums, make a great show of the impossibility of Zeppelins coming between the periods of the first and last quarters, and here again their sole reasoning is based on the hazard that that alone which has happened shall occur again. I am of the opinion that not only could Zeppelins make nocturnal raids at full moon time, but that they could also visit us by daylight under such favouring conditions of cloud and thick haze as occasionally prevail over the greater part of western Europe. They are more likely to avoid a clear, moonless, starlit night than a hazy moonlit night. Their main object is to come at a time when aeroplane work is dangerous and airship work is easy; when the range of searchlights is shortened and gunners are at every possible disadvantage.

Few Weather Mistakes

So far as it goes, I must give the directors of their operations credit in their selection of the weather. On only one reported occasion have they turned back on this ground through a mistaken calculation, prior to starting, as to the approach of a deep Atlantic cyclonic centre from the Atlantic. A considerable knowledge of meteorology is certainly possessed by some one or other officer on board, and it must be remembered that, directly the signs point to the approach of any such centre, the Zeppelin, by turning back, has double a sufficiency of speed to enable it to run out of the approaching sphere of influence (with its accompanying high winds), which more than ninety times out of every hundred comes

from westerly points. Thus, while we have the advantage of forecasting, they possess the benefit of being able to do without to a very considerable extent. Thus they save their material, even though the raid proves a fiasco so far as bombing anything but the bare surface of the North Sea is concerned.

Suitable Types

As a matter of fact, of infinitely more concern to the raiders than the weather over our islands are the conditions at home when they are starting and those which are likely to prevail at the time they are due to return. Of these they must make fairly certain if the safety of their ship is not to be imperilled. Frequently, when the appearances in England may have seemed ideal for their purposes, there can be no doubt that locally at their bases they have been of quite an impossible character, and this has prevented an attempt. Once well aloft, a Zeppelin, properly guided by a meteorologist, can easily avoid anything in the shape of a snow squall, and it could run right round an ordinary summer thunderstorm with its violent indrive of air towards the centre. Local weather conditions here will never prevent a raid being attempted. All the statements which have appeared, and there have been hundreds, that the raiders choose a light easterly breeze or prefer a light westerly breeze are quite beside the mark. Their first preference is for a well-established anti-cyclonic type over western Europe, their second for a trough of relatively low pressure with its slight and local irregularities, while they will have nothing at all to do with a general Atlantic cyclonic type.

What They Can See

It is probable, though not certain, that the commanders of Zeppelins at present fix their journey by chart and steer a marked course across vulnerable points by compass, and thus practically trust to chance to reach any desired objective. The German statements of supposed results go far to show that this plan is very rarely successful. They appear to know whether they are above land or water, but beyond that they are merely "in the air." In the type of weather they have shown acumen in selecting, a single light from a window could not be observed at a distance of 6,000 ft., but the glow of a town could not be missed ten miles away. It is not the individual lamp but the general effect which has given them a knowledge of where to strike the population. There are many places I could mention where no excessive lighting of premises occurs, but where the general effect can be observed miles away. The local authorities are the culprits and should be heavily penalised. The chance of a Zeppelin hitting anything at all with a score of bombs, without a certain amount of light marking a populous district, is a hundred to one chance against.

What We Require

It is not within my province even to mention our measures of military defence. I must leave the criticism, praise or blame, of the Government in this department to those who are in the know of what is happening to prepare for the larger raids in the near future. As defenders from sporadic attacks our airmen have no chance of choosing the weather they would like for their operations, and the task of rising to attack the Zeppelins, quite apart from any chance of being shot down, is one that calls for a big display of heroism. The descent involves a terrible risk, as is shown by the published casualties. In these, the early days of air fighting, as in the first days of sea fighting, judgment of the weather on the part of the contending admirals is certain to be one of the chief factors in success or failure. I hope we shall ultimately have the advantage on our side. At present—I have not the slightest doubt on the point in my mind—we have not got it, or anything like it. We have the men and we have the money, and we only want some one to apply them.

RANDOM REMARKS

XLVI.—“NEXT, PLEASE!” By ARTHUR LAWRENCE

I SUPPOSE the power behind any throne is the Prime Minister. He is the upper servant of the State. What he says “goes.” It is his privilege to whisper words into the ear of his Sovereign and to write words in his name. I don’t know that the barber has quite all these privileges in regard to those whom he serves, but his intimacy with the great ones of the land is of a pleasing description. He is the only man who may hold your nose with impunity, and possibly with fingers reminiscent of a doubtful cigar. I am always restive under his attentions myself, and I hold aloof from his company until such time as Nature insists upon the cutting of hair and a shampoo. The



“INTIMACY WITH THE GREAT ONES OF THE LAND”

razor is a weapon which I prefer to handle myself. I hold with the barber in this, that I prefer the old-fashioned implement and have handed over my safety razors to those who seem to know how to use them. Give me a fine bit of steel and a strop and I will create for myself a good appetite for breakfast without shedding any of the best blood in England. After all, I know the lie of the land better than the more professional person. It is my one form of exercise, and I will not be robbed of it by the best barber that breathes.

So far as I have been able to observe, the aviator would appear to be a clean-shaven person. He has not cultivated that incipient moustache which marks the slender frame of a young man who has obtained a commission. It would be idle of me to speculate on this fact. Certainly I cannot picture an aviator with whiskers. They might affect the streamlines about which this paper’s experts get so exceedingly eloquent. I doubt if an aviator cares to part his hair on one side of his head. He has to think of his metacentral stability. He either does it dead in the centre or brushes the whole business back. I hope he doesn’t assist matters with soap or oil, but some of the photographs I have seen rather suggest it. I don’t imagine that he would be deliberately guilty of that enormity. The Oxford and Cambridge rules are against it, but when oil is spurting out of the engine upon your big dome of thought, you may chance to pass your hand over it, and so give a false impression of your habits when a snap-shot picture of you is taken. I have visited some of the most distinguished barbers of my own country, who have taken with me those minor liberties which one so strongly resents. It has always been a matter of some little difficulty to dissuade them from saluting my cranium with some greasy preparation, and once or twice I have had to be shampooed all over again in order to get rid of some swift dab of oil. It came upon me at last that I should have to construct my own barber, and for some years I have had one whose hair has grown quite red in my

service. I will let any certified aviator have his address upon application.

The ceremonial established between us has been evolved in the process of time. One of his underlings, forewarned of my approach, would be despatched on a special commission which resulted in a foaming tankard of ale being placed at my disposition, a cigarette adjusted to my ruby lips, and, after a brief discussion in regard to my debt I would agree to a loan of half-a-crown. We are on even terms up-to-date, but when I am again shorn of my whilom locks, I shall blossom into unwonted prosperity. I have a great regard for Sir Rufus, and only visit him as and when the occasion requires. I shall never know if he reciprocates, but he has never abated his tenderness towards my restive temperament. Moreover, his appreciation of the fact that I ought to be paid for my attendance gives him a high place in my estimation. There might be more men of his stamp if the run of customers was not so subservient. It is well to resign yourself to his hands, as to a surgeon who shall not be balked of his prey; but this should be done within limitations. It must be remembered



“THE METACENTRAL STABILITY OF THE AVIATOR”

that if too much is taken from you, those precious locks cannot be replaced. It is better to let your man err on the right side, and then, if your ears have not become sufficiently prominent, you can point out spots calling for further excision. When you have finished admiring yourself in the glass, it is as well to present the artist with any stray lock of your hair which you can find on the floor, as this little token of esteem will help to keep your individual requirements alive in his memory.

A SLIP OF THE PEN

From France comes to me a missive from “An Officer who Knows”—just that and nothing more—severely taking me to task for mentioning in an article contributed to a contemporary that the Lewis gun was water-cooled, and counselling me to make sure of my facts before penning any more rubbish; or words to that effect. I plead guilty. *Mea culpa.* I dare not even visit the sin of commission upon the luckless printer’s devil, though, as Mr. Tennant knows, he has much to answer for. Let me, therefore, penitently confess to a slip of the pen, though I trust even my anonymous correspondent does not class me with the dear old lady who one summer’s day in the years long gone explained to her attentive offspring that a biplane has two wheels whereas a monoplane only possesses one. Apropos of nothing whatsoever: as I neared Hendon this week-end, seated on the top of an electric chariot, an admiring female behind caught her first sight of an airy-plane: “Golly, Bert, look; ain’t it just like a butterfly.” It was the new Handley-Page. I. H. L.

PROGRESS OF AMERICAN AVIATION

By ERNEST L. JONES, American Editor

AERO CLUB NOW FOR NATIONAL REGISTRATION

"AERONAUTICS" has been urging for years the federal registration of aircraft and licensing of operators. The Aero Club of Pennsylvania realised the importance of this two years ago, when it was brought to the club's attention through AERONAUTICS, and had a Bill considered by Congress, but it got no further than a Committee. The Aeronautical Society passed a resolution in its favour, and asked Congress to pass the Bill.

At last the Aero Club of America has committed itself as favouring the Bill in a Press notice sent out to newspapers, embodying the contents of a letter to a Congressman who has entered a Bill for the establishment of a Department of Aeronautics and a Secretary thereof.

The letter says:—

"We would suggest that you add to the Bill (H.R. 13,838, to establish a Department of Aeronautics, and a

"What is needed is a system of Federal licensing which will enable aviators to fly across the continent with the least inconvenience. A sportsman, Mr. Blakeman B. Lewis, has started from Coronado, California, for a flight across the continent. In a few years such trips will be common, and will be made in between twenty-five and forty hours. If State registration were necessary it would take longer to register than to cross the continent.

"Registration of aircraft is recommended as an important measure. There have been reports of late of strange aeroplanes which have been seen flying near large munition plants. Had we a system of registration, all aircraft would be under Federal control."

AEROPLANES IN MEXICO

EIGHT machines are being used in connection with the expedition to capture Villa in Mexico. A rush order has been sent to Curtiss for four machines, and to the Sturtevant Aeroplane Co. for four more.



INSTRUCTORS AT NEWPORT NEWS CURTISS TRAINING SCHOOL

Left to right: Bert Acosta, Victor Vernon, Victor Carlstrom, Capt. T. S. Baldwin (Manager), Steve MacGordon, T. R. Macaulay, Stewart Cogswell

Secretary thereof), if possible, a provision for licensing and registering of aviators by the Department of Aeronautics, so it would not be necessary to have a State licence, as required for automobiles. . . .

"In urging that this be done, we have in mind that if it is not done some of the States may do as the State of Massachusetts did. This State passed a law providing for State licensing of aviators. Unfortunately, the cost of having experts to put aviators through their tests was beyond the State Treasury's resources, and the law could not be made operative in that respect; although it is operative to the extent that an aviator has been fined for not having taken the State licence, which he applied for, but could not be given to him because there were no experts to put him through the tests.

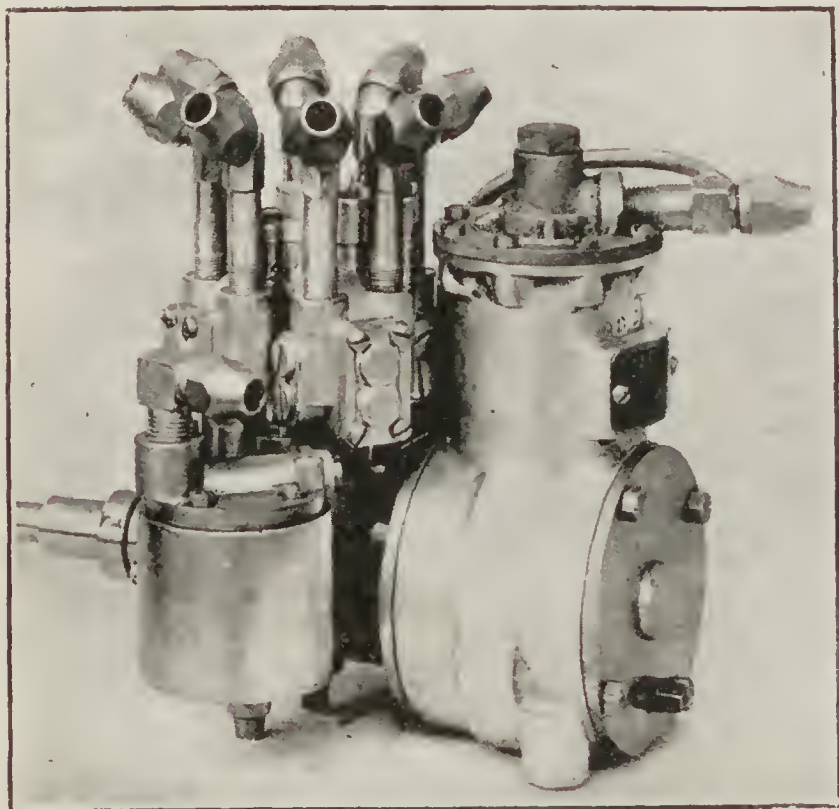
THE CHRISTENSEN SELF-STARTER

The N. A. Christensen Company is manufacturing a self-starter especially and particularly suitable for aeroplane motors, and it is being used by the Curtiss, Roberts and Thomas companies. The accompanying illustration will give a very fair idea of the starter unit. It can be applied to old or new motors of any multiple cylinder type, is compact, light in weight, simple in operation, and very highly efficient.

It is well understood by manufacturers and users of petrol motors that the operation of such motors depends entirely on a charge of air and petrol in vaporised form drawn into the cylinder, compressed by the piston, and ignited by means of an electric spark. Now, then, this being the natural condition under which the motor operates, it is

necessary, in order to start a dead motor, to bring about this natural condition of furnishing the compression stroke without manually turning or cranking the motor.

The operation is as follows: Air is first pumped from the compressor into a tank conveniently located in the fuselage. To start the motor the compressed air is drawn through the control valve on the dash or instrument board to the special carburetter (part of the unit), where it picks



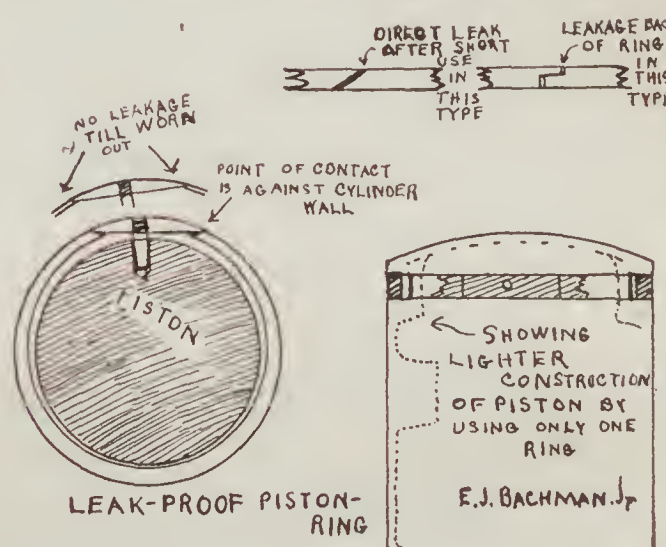
FRONT AND REAR VIEWS OF CHRISTENSEN STARTER

up the petrol in a thoroughly atomised form and through the automatic distributor this petrol gas, under compression, is carried to the motor cylinders in firing sequence. The charge of petrol and air, the compression stroke, as it were, immediately starts the piston moving downward, the spark takes place, ignites the charge, and the motor is set in motion.

The control valve governs all operations from the driver's seat, namely: One position of the handle is for starting, another for throwing the pump into and out of service, and a third for tire inflation. When the engine is running all parts are out of engagement, consequently, there is no wear. Lubrication is automatic. All the parts are made of aluminium and chrome vanadium steel, heat treated, and ground to a perfect fit, and the starter will outwear the motor on which it is mounted. There is no hesitation in starting, no churning of gears, etc., no complicated system of wiring, no short circuits, no storage batteries, and the weight of an aeroplane apparatus is about 40 lbs. Furthermore, the apparatus is fully guaranteed in every respect.

MORE EFFICIENT PISTON RING

The sketch is to illustrate a piston ring, which is claimed by the designer, Edwin J. Bachman, Fullerton, Pa., to be more efficient than those in general use. The ring itself is machined eccentric, the small position piece being machined separately; but the whole is assembled, compressed, and ground on a mandril to ensure perfect bearing on the full



circumference as soon as put in the engine. As may be seen by the sketch, the ring may be worn very thin and still have perfect contact. It is the inventor's idea to have but one ring to lessen weight and vibration.



A NEAR VIEW OF UNCLE SAM'S TOY AIRSHIP

MODEL AEROPLANES—XXXI

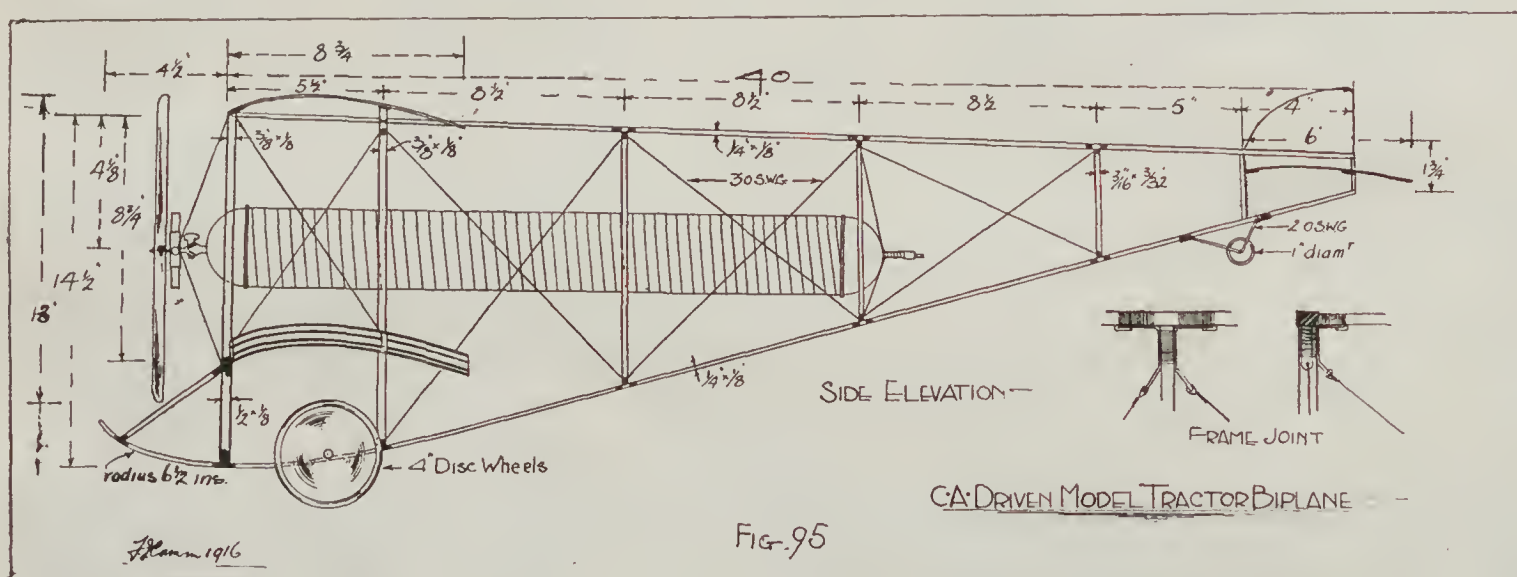
By F. J. CAMM

IT is from the results obtained from the testing of the motor that the dimensions of a suitable model for it are determined, and while the design I am submitting may possibly suit the majority of the plants constructed from my drawings (and I would here point out that the model has been designed to suit my own plant, although pressure of other matters has precluded my building it), it is merely here given as an illustration of the correct method of designing a machine, and this preamble will not have been written in vain if the reader realises the importance of this point. As I have been at pains to point out in a previous issue, the designing of a rubber-driven model too often takes the form of guesswork, and as we cannot vary the power of the little c.a. motor, recourse to some established line of reasoning becomes essential. I would therefore urge the reader to vary the dimensions of the surfaces in consonance with the calculations I shall give hereunder.

The first thing to do, then, once the plant has been "tuned" up, is to ascertain the thrust obtainable from it. This is found by suspending the plant by the valve upon a balance, with a container fully inflated, the weight registered being carefully noted. The container pressure should now be released, and the weight registered when the motor is running observed. By subtracting the former from the latter the thrust is obtained.

The next point to be decided on is the loading, and as the model is to be a biplane, a comparatively light loading can be used. In the case of the machine shown in side elevation in Fig. 95, four ounces has been taken as the loading per square foot. So that the total area of the wings will be $\frac{20}{4} = 5$ sq. ft. = 720 sq. in. I have decided on a span of 54 in. for the top plane and 46 in. for the bottom one, and by using a chord of $8\frac{3}{4}$ in. the total area of the wings vies very approximately with this figure, allowing a small margin for excess weight. The area of the tail, which is non-lifting, need not be taken into account. Although I have given the "gap" as being equal to the chord, it could be made, if anything, half an inch greater.

Now with regard to actual materials. Birch is to be used for the longitudinals, straight in the grain and of the cross sections illustrated. The lower member is bent under steam to the curvature shown—of $6\frac{1}{2}$ in. radius. Two vertical struts support the wings, and these should be cut from hickory. A short tie-strut secures the bottom longitudinal to the front inter-strut, the joint being by means of side angle plates bound into place. It will be found good practice to make a full-size drawing of the machine in side elevation, so that it can be used as a template to fit up the cross members—particularly with regard to the putting of the angles.



Thus, assuming the plant, at rest, to weigh eight ounces, and when running twelve ounces, it is clear that the thrust is equal to four ounces. Now, we require to know the average thrust developed, since, as hitherto explained, the thrust is not constant, but gradually diminishes as the density of the air in the container approaches normal atmospheric conditions, i.e., 14.6 lb. (known as an atmosphere). It is possible to obtain some very interesting data by plotting a graph of the thrust given off at various moments from the release of the pressure in the container, and I hope to deal with this point subsequently. Meanwhile it can be taken as a good rule that the thrust registered after one-third of the effective run of the motor represents approximately the average thrust; and the figure given above (four ounces) will serve for the purpose of illustration.

We next desire to know the weight of the model it will lift. I think it is fairly well established that a plant will fly a machine weighing from four to six times the weight of the thrust it develops, although, of course, much depends on the efficiency of the model, the greater the complexity of frame members the lower the lift drag ratio, and consequently the lower the ratio between the thrust and the weight of the model. Compromising, and taking 5:1 as the ratio, twenty ounces is obtained as the total weight of the plant and model.

A sketch is given of the joint of the longeron to the cross member. The usual fish plates are employed, so made that a small wiring plate is left protruding from the binding, to which the cross-sectional and longitudinal sectional wires are made off.

The plant itself is slung into the framework by means of eight wires, each being made off to the wiring plates. Each should also be provided with a small $\frac{3}{4}$ -in. wire strainer to enable the plant to be fixed quite rigidly—albeit permitting of its being removed for inspection or repairs. The wires from the engine itself are taken off from the four small eyes soldered to the stationary portion of the crankshaft, as explained in a previous article. Great care should be taken to ensure that the plane of rotation of the screw is at right angles to the main planes.

A $1\frac{1}{4}$ in. dihedral is given to the bottom plane by means of the bracing wires passing between the inter-struts, and which will be shown in the front elevation to be given subsequently. I have thought it advisable to attach a small rear wheel, to enable the model to rise off ground with as little loss of power as possible. Such a wheel with attachments need weigh no more than three-eighths of an ounce, and is a great improvement over the cane skid usually employed.

In bracing the outriggers, or longerons, some care will

be required to ensure their being quite true; it will be found easier to finish each section off first, so that they are quite parallel at the joints. A plan view of the machine will be given next week, and meanwhile all frame parts should be made and fitted ready for permanent assemblage when the details are given.

(To be continued)

Errata—In Chapter XXIX. read 162.642 cu. ins. as the volume of the container, in place of 62.642.

REPLIES TO CORRESPONDENTS

A.E.S.S. (Streatham Common)—The foil should be cut into strips $2\frac{3}{4}$ in. wide, and the width of the lap should be about half this. With regard to your queries concerning the sleeve, if you refer to col. 2, commencing at line 8,

March 15 issue, you will note that I wrote: "*the sleeve encasing the crankshaft should be turned to make a good fit around it. The high diametrical limit should not be more than one and a half thousandths of an inch (.0015) over the diameter of the crankshaft, etc.*" The diameter of the crankshaft given in Fig. 78 is $\frac{1}{2}$ in., and therefore the bore of the sleeve must be .5015 ins. The diameter of the crankshaft outside the abutting collar is $\frac{9}{16}$. The inlet port should be $\frac{1}{64}$ of an inch out of coincidence with the crank pin— $\frac{1}{16}$ inch is excessive, and would cause back pressure. The speed of the writer's plant is quite 1,600 revs. a minute; probably you have not worked to sufficiently fine limits, and a great wastage of pressure is resultant. Write us again if further trouble is experienced.

MODEL EDITOR

AIRCRAFT IN ACTION

OFFICIAL INFORMATION

ENGLAND

April 25—Zeppelin Raid on East Coast—War Office announcement: "Last night's (April 24) air raid over the Norfolk and Suffolk coasts appears to have been carried out by four or five Zeppelins, only two of which made any serious attempt to penetrate inland. About seventy bombs appear to have been dropped. One man is reported seriously injured. No further details as to casualties are yet available."

(The earlier communique issued by the War Office was published in our April 26 number.)

April 25—Twenty-Nine Air Combats—Yesterday (April 24) there was considerable aerial activity. Twenty-nine combats took place. One of our reconnaissances was persistently attacked. All the attacks were driven off, and two hostile machines were seen to fall to the ground in the German lines. All our machines returned safely.

April 26—Allied Aerial Activity—Admiralty announcement: "On the morning of April 23, in spite of most inclement weather, a bombing attack was carried out by naval aeroplanes upon the enemy aerodrome at Mariakerke. The machines were heavily fired upon, but succeeded in returning safely. As far as could be observed, good results were obtained. One of our fighting machines attacked an enemy aeroplane and drove it down. The hostile machine when last seen was close to the ground and out of control."

"On the morning of April 24 a further attack was carried out on the same objective in co-operation with our Belgian Allies. A large number of bombs were dropped. Heavy fire was encountered by all machines, but there were no British casualties. The results obtained appear to have been very good. During the course of the same day (April 24) a British aeroplane attacked an enemy seaplane about five miles off Zeebrugge. The enemy pilot was killed, and the machine dropped. The enemy observer falling out while the machine was still at a height of 3,000 ft. The hostile seaplane crashed into the sea and sank."

"During the operations against the German Battle Cruiser Squadron which appeared off the East Coast on the morning of the 25th inst., two Zeppelins were pursued by Naval land machines over sixty miles out to sea. Bombs and darts were dropped, but apparently without serious effect. An aeroplane and a seaplane attacked the German ships off Lowestoft, dropping heavy bombs. Four enemy submarines were also attacked by bombs. One seaplane came under heavy fire from the hostile Fleet, but the pilot, although seriously wounded, succeeded in bringing his machine safely back to land. It is regretted that one pilot is reported missing. He ascended during the course of the Zeppelin raid earlier in the morning and appears from reports to have attacked a Zeppelin off Lowestoft at about 1.5 a.m. He has not been heard of since."

April 26—Enemy Machine Brought Down—Hostile aircraft were less active yesterday. This morning a hostile aeroplane was brought down in our lines as a result of a fight in the air. Both pilot and observer were killed. At 12.30 a.m. a hostile airship dropped bombs near the coast behind our lines, doing no damage.

April 26—Zeppelin Raid on Essex and Kent—War Office report: "April 26, 3.30 a.m."

"Hostile airships raided the counties of Essex and Kent last night (April 25). Their number is uncertain, but cannot have exceeded four. The raiders were met by a brisk fire from anti-aircraft guns, and retreated after having achieved little or nothing."

"April 26, 4.25 p.m."

"No fresh facts have been reported concerning the Zeppelin raid of last night. The Thames Estuary was visited by the raiders and over 100 bombs were dropped. Not a single casualty is to be recorded. With reference to the raid over the Eastern Counties the previous night, the total number of bombs discovered is about 100. There was only one casualty. The damage consists of the death of one horse, the destruction of a haystack, and much broken glass."

(See German Official)

April 27—Zeppelin over East Coast of Kent—War Office report: "Zeppelins were reported over the East Coast of Kent between 10.30 and 11 p.m. last night (April 26). No reports as to their having

penetrated far inland have been received up to the time of the issue of this *communiqué*, and as it is misty over East Kent it is probable that they turned back before midnight. It is reported that one bomb was dropped, which fell into the sea."

(See German Official)

April 27—Much Aerial Activity—Yesterday (April 26) there was much aerial activity. Nineteen combats in the air. The machine reported yesterday as having been brought down in our lines was a two-seater. It was attacked by a single-seater three times at a great height. The enemy pilot was shot through the heart and the observer through the body. The machine crashed to earth, with the engine full on, from a height of 14,000 ft. One of our reconnaissances was attacked by eight hostile aeroplanes. All hostile attacks were driven off and one hostile machine down. Our reconnaissance was completed. Two of our aeroplanes were damaged, but all returned safely.

April 28—Four Enemy Machines Driven Down—In the air there was considerable activity again, twenty-four combats taking place. Four of our machines attacked eight hostile machines flying in formation, and drove a wedge into the middle of them. After a fight lasting ten minutes four of the enemy's machines were driven down, one landing in a ploughed field. One of our machines was hit, but we suffered no casualties. In another fight a hostile machine is believed to have been hit.

April 29—Two German Machines Downed—Yesterday (April 28) the fine weather enabled much successful air work to be done. There was a marked decrease in the number of hostile machines seen yesterday, and only four combats in the air took place. No loss on our side. To-day two German aeroplanes were brought down behind our lines.

FRANCE

April 25—Bombs on Dunkirk—This morning (April 25) a German aeroplane dropped six bombs on Dunkirk. One woman was killed and three men were wounded. The material damage done was insignificant.

April 25—French Aerial Activity—Near Vauquois an enemy aeroplane was forced to land in his lines after a fight and was destroyed by our gun fire. In the region of Verdun one of our chasing aeroplanes brought down a German aeroplane, which fell on Poivre Hill, 50 yards from our trenches. A third machine brought down by one of our pilots fell in the Forges Wood. Finally, a Fokker, riddled with machine-gun fire at pointblank range by one of our aviators, dived vertically in the region of Hattonchattel. During Monday night (April 24) one of our dirigible airships threw 10 shells of 6-inch and six shells of 9-inch on the station of Conflans (midway between Verdun and Metz).

April 26—Bombs on Bivouacs—An Aviatik which had lost its way landed last night (April 25) in our lines in the environs of Rosières (Oise). Its two officers were taken prisoners. An enemy aeroplane, shelled by our anti-aircraft guns, fell in flames in the direction of Bagatelle-Pavillon, north of the Four de Paris. The German aeroplane which fell yesterday (April 25) in the enemy lines near Vauquois, and which was destroyed by one of our guns, was brought down by Sub-Lieutenant Navarre. This is the ninth enemy machine brought down by this pilot. During the night of April 25-26 our bombardment aeroplanes were particularly active in the region of Verdun. Fourteen bombs were dropped on the parks and bivouacs in the environs of Etain, four on bivouacs near Damvillers, six on the station of Briellules, 15 on the station of Conflans, six on the station of Pierrepont, six on the steel works of Jœuf-Homecourt, 10 on the station of Mézières, and two on Réthel.

April 26—French Aviators' Exploits—This morning, at about 3 o'clock, one of our aeroplanes, armed with a gun, having been attacked by a Zeppelin off Zeebrugge, at a height of 13,000 ft., fired 19 incendiary shells at the airship. The Zeppelin appears to have been struck. At the same time, off Ostend, another of our machines, armed with a gun, fired several shells at a German torpedo-boat, which was hit. One of our pilots, after an aerial engagement, this morning brought down a Fokker, which fell in our lines near Hoëville, north of Lunéville. The enemy aviator, who was wounded, was taken prisoner.

April 27—Two Machines Shot Down—One of our pilots brought down an enemy aeroplane, which fell headlong into the forest of Spincourt (north of Verdun). During the daytime yesterday (April 26) an enemy aeroplane, brought down by the fire of our motor-guns, fell in front of the Fort of Vaux. During the night of April 26-27 three of our airships carried out bombardment operations. Numerous heavy projectiles were dropped by them on the stations of Etain and Bendorf, and on the Arnaville railway. The same night our aeroplanes dropped 37 bombs of 120 mm. on different stations in the valley of the Aire, 25 bombs of 120 mm. on bivouacs in the valley of the Orne, six bombs of 120 mm. and two incendiary bombs on the station of Thionville, and eight bombs of 120 mm. on the station of Conflans.

April 28—Four Machines Brought Down—During yesterday (Thursday, April 27) our aircraft fought a number of aerial battles. An enemy aeroplane was brought down in the region of Fromezey. Two other enemy machines, attacked by ours, were brought down seriously hit—one near Douaumont, and the other in the Bois de Montfaucon. Finally, in the region of Nesles-Chaulnes, a Fokker, fired on by the machine-gun of a Nieuport, fell vertically into the German lines. During the day one of our bombarding squadrons dropped 18 shells on the railway station of Lamarche, in the Woevre. During the night of April 27-28 our aeroplanes bombarded the station of Audun-le-Romains, hutinents near Spincourt, and the stations of Grandpré and Challeranges.

April 29—Bombs on Factory—During the night of April 28-29 one of our air squadrons bombarded a factory in full operation at Hayange (annexed Lorraine) and bivouacs to the east of Azannes. This operation, which was carried out in spite of a very violent wind, constitutes the hundredth bombardment effected by the same squadron.

April 30—Ten German Machines Brought Down—An Aviatik was forced to come down in the valley of the Biesne, in the Argonne, after an engagement with our chaser-planes. The enemy machine is undamaged, and the two officers who occupied it were taken prisoners. One of our aircraft attacked two Fokkers over the German lines in the region of Roye. One of the two machines was shot down by machine-gun fire from a height of 5,000 ft., and was smashed to pieces. The other was obliged to land. Two other Fokkers were brought down by our fighting aircraft—one near Les Eparges, the other south of Douaumont. Five enemy aircraft dropped bombs on the regions south of Verdun. Our chasing aeroplanes were sent in pursuit. Two of the enemy machines were brought down by them, and a third was brought down by our special anti-aircraft guns.

RUSSIA

April 25—Bombs on Railway Station—Our aviators threw 36 bombs on important points behind the enemy's front, particularly on the railway station of Jelovka, west of Illukst. Enemy aeroplanes dropped bombs in the region of Molodetchno.

April 26—Bombs on Dvinsk—Enemy aeroplanes dropped bombs near Dvinsk and on the town itself. In the same region (south-east of Vilna) a number of German aeroplanes flew over our lines. One of them was hit and fell in our lines south-east of Krevo. Enemy aeroplanes dropped bombs on the railway station of Gontzevitchi, between the railway stations of Baranovitchi and Luninets.

April 27—Aerial Activity—Enemy aeroplanes flew over our Dwina lines at many points and dropped bombs. Seven enemy aeroplanes yesterday (April 26) flew over the Dvinsk region. One of them bore the distinctive marks of a Russian aeroplane. Our Iliia-Mourometz giant aeroplane bombarded the railway station of Daoudzeras, south-east of Friedrichstadt. Thirteen bombs, each weighing 40 lb., were thrown, besides seven others filled with splinters. These bombs started fires at the railway station of Ujvertynie. Enemy aeroplanes at several points flew over the cantonments of General Evert's troops, and dropped bombs.

April 28—Enemy Machine Brought Down—North of Lake Drisviaty our artillery brought down an enemy aeroplane, which fell behind the enemy's trenches. German aircraft dropped 30 bombs in the region of the village of Ostrovki, north-east of Stolbtzy, killing a number of Austrian prisoners.

April 29—Dirigible Drops Bombs near Dwina—Yesterday (April 28) shortly before 2 o'clock in the morning, a dirigible appeared over Reshitza (50 miles west of the Dwina), where it dropped explosive and incendiary bombs. In the Black Sea one of our submarines, which was bombarded by enemy aircraft and batteries without success, sank a steamer and a sailing ship.

EAST AFRICA

April 24—Aeroplanes in East Africa—The burghers are pursuing the fleeing enemy as fast as the condition of the horses will permit. Remounts are being rushed forward; the military telegraphists, aeroplanes, and the supply troops are endeavouring to catch up.

EGYPT

April 25—Bombs on Enemy Camp—War Office announcement: "The pursuing column mentioned in yesterday's report took several more prisoners, and the aeroplanes inflicted severe casualties with bombs and machine-gun fire. On April 24 eight aeroplanes took part in an attack on the enemy camp near Katia and succeeded in effecting a complete surprise. The hostile camp was completely destroyed, and the enemy suffered severe casualties from the bombs dropped and from machine-gun fire."

April 26—Bombs on Port Said—War Office announcement: "The Katia oasis (east of Suez), except for a force of 1,000 men who are still established at Bir el Abd, is now clear of the enemy. The Turks have paid dearly for this raid, as their losses, particularly at Duweidar and as a

result of the aeroplane attack, have been very heavy. On April 25 hostile aeroplanes dropped bombs on Port Said. No damage or casualties have been reported. Early on the same morning eight of our aeroplanes made a bombing attack on the Turkish force at Bir el Abd. All the machines returned safely. Later on, an attack by British aeroplanes was made on Bir el Bayud, eight miles south of Bir el Abd. The enemy were fired on with bombs and machine-guns from a height of 400 feet with very successful results." (All the places mentioned, except Bir el Bayud, are on the northern route from Palestine to the Suez Canal, which runs at a little distance from the coast. Their distances from the Canal are approximately—Duweidar, 15 miles; Katia, 30 miles; Bir el Abd, 44 miles.)

April 28—Aeroplanes Locate Ship—War Office statement: "Our aeroplanes have discovered that the relief ship is aground near Magasis, about four miles east of Kut."

April 28—Bombs on Port Said—Turkish official: "On Tuesday morning (April 25), in order to revenge the defeat which he had suffered, the enemy attacked Katia with a squadron of nine aeroplanes. Our aeroplanes thereupon attacked an enemy steamer at Port Said and military buildings, and successfully dropped bombs on an enemy war vessel off El Arish and all the enemy camps between Port Said and El Kantara. Our machines returned safely."

(See English official)

ITALY

April 27—Aerial Activity—Along the Trentino front from Garda to Brenta there was artillery and aeroplane activity on both sides.

April 30—Enemy Aircraft Driven Off—Between the Giudicaria and Sugana valleys artillery activity and aerial reconnaissances took place. Enemy aeroplanes aiming at Verona were repulsed by our anti-aircraft artillery and aeroplanes, the latter of which gave chase. Enemy aeroplanes shelled the villages on the Lower Isonzo. There were some casualties, besides slight material damage.

TURKEY

April 29—Raid on Smyrna—A torpedo-boat and two hostile aviators on the evening of April 13 attempted to approach Seddel Bahr, but were put to flight by our artillery fire. On April 12 and 13 two hostile aviators flew over Smyrna and dropped bombs without effect.

AUSTRIA

April 30—Italian Machine Forced to Descend—Our aviators dropped bombs on the enemy's barracks and camp near Villa Vicentina. After a successful air fight all the machines returned safely. Near Daniele del Friuli an Austrian aviator fought four Italians and compelled one of them to descend precipitately.

GERMANY

April 25—Two Enemy Machines Brought Down—The activity of the artillery and the aviators has been very lively on both sides. Our aviators freely bombarded numerous enemy shelters and supply stations. An enemy aeroplane was brought down by our anti-aircraft fire near Tahure and was destroyed. Another machine was brought down to the east of the Meuse. This somersaulted to earth.

April 25—Raid on Railway—A German aeroplane squadron attacked the railway and warehouse establishments of Molodetchno. Good results were obtained.

April 26—Bombs on Dvinsk—A German aerial squadron freely dropped bombs on the flying ground at Dvinsk.

April 26—Raid on East Coast of England—At daybreak on April 24 a section of our High Sea forces bombarded with good success fortifications and important military buildings at Great Yarmouth and Lowestoft, and afterwards opened fire on a detachment of enemy aviators, small cruisers, and torpedo-boat destroyers. Simultaneously with the attack of our naval forces a naval air squadron attacked during the night of the 24th the Eastern Counties of England, and bombs were dropped with good effect on industrial buildings at Cambridge and Norwich and railway buildings near Lincoln and on batteries near Winterton, Ipswich, Norwich, and Harwich, as well as on enemy patrol boats off the coast. In spite of a most violent bombardment, all our airships landed untouched in our harbours. Aeroplanes of our naval air detachment early on Tuesday morning effectively pelted the harbour works, fortifications, and aerodrome of Dunkirk with bombs. All returned undamaged.

(See English official)

April 26—Zeppelin Raid on England—"During the night (April 25) German military airships attacked the English fortified and port establishments of London, Colchester, Blackwater, and Ramsgate, as well as the French port and the large English supply depot at Etaples."

April 26—Two French Aeroplanes Brought Down—Apart from other aerial enterprises, one of our flying squadrons dropped a large number of bombs on the French flying ground of Brocourt, east of Clermont, and on the strongly held village of Jubécourt. Two enemy aeroplanes were shot down in an aerial fight above Fleury (south of Douaumont) and west thereof.

April 27—Airship Attack on Margate—"During last night (April 26) an attack was made by an airship on the port and railway depots at Margate, on the east coast of England." (See English official)

April 27—Three Machines Shot Down—In air fighting one enemy aeroplane was shot down near Souchez and another south of Tahure, and a third by our anti-aircraft guns south of Parroy. The railway line in the Noblette Valley, south of Suippes, was liberally pelted with bombs by a German aeroplane squadron. One of our airships dropped bombs on the harbour works and railway establishments of Ust Dvinsk (at the mouth of the Dwina).

April 28—Three Machines Brought Down—Two enemy aeroplanes came down, after battles in the air, west of the Meuse—one over Bethelainville and a second near Very. A third machine was brought down by our anti-aircraft guns near Frapelle, east of St. Dié. A German squadron dropped numerous bombs on the barracks and railway station at St. Ménéhould.

Eastern Front.—The railway establishments and magazines of Reshitza (50 miles east of the Dvina) were bombarded by one of our airships. Several aerodromes were attacked by aeroplane squadrons. Three German aeroplanes yesterday (April 27) dropped 31 bombs on the Russian warship *Slava* in the Gulf of Riga, making several hits. A fire was clearly observed. Despite a very violent bombardment all the aeroplanes returned undamaged.

April 29—Airship Bombs Railway—Our airships attacked the railway precincts near Wenden (on the Riga-Petrograd line) and on the line from Dvinsk to Reshitza (50 miles east of the Dvina).

April 30—Three Enemy Machines Brought Down—Our anti-aircraft guns brought down a French biplane south of Moronvilliers, in Champagne. The occupants were dead. First Lieutenant Bocke shot down, south of Vaux, his fourteenth enemy aeroplane. During an aerial battle over Verdun and Belleray with three enemy machines a German airman shot down one machine.

FROM OTHER SOURCES

ENGLAND

April 27—Rescue of British Aviator—A lugger has brought into Scheveningen a biplane, with a British officer. The biplane was picked up fourteen miles from the coast. The officer, whose name is given as Beare, had been thirty hours in the sea, having been compelled to descend owing to lack of benzine.

An official report by the Dutch General Headquarters states that Naval Flight-Lieutenant Beare has been liberated, as he was picked up shipwrecked outside Dutch territorial waters. His biplane will, however, be interned until after the war.

[Flight-Lieutenant Beare was the officer who attacked a Zeppelin near Lowestoft in the early morning hours of April 25, and was reported as missing in the Admiralty *communiqué* of April 26.—Ed.]

FRANCE

April 29—Airship Patrols—The *Echo de Paris* says that it has obtained information in a high quarter of the important part that dirigible balloons can play in maritime warfare. If the French lighter-than-air machines, the journal continues, are inferior to Zeppelins as regards cubic capacity, speed, and radius of action, they are superior from the point of view of reliability and of the extreme skill of the crews and commanders. Each great French port, the journal declares, is at the present moment guarded by two swift dirigibles which night and day scour the roadstead and carry out far-reaching flights. A number of seaplanes second the efforts of the airships. These measures, however, do not prevent torpedo-boats from perpetually circling round the ships in the roadstead. All these precautions afford almost complete protection to the Allied shipping from the German pirates.

BELGIUM

April 24—Bombardment of Belgian Coast—The *Telegraaf* learns from the Belgian frontier that Zeebrugge, Heyst, Duinbergen, and Knocke were bombarded on Easter Monday (April 24). The bombardment is believed to have been the heaviest to which the Belgian coast has so far been subjected. About four o'clock in the morning aeroplanes appeared above Zeebrugge harbour, and the sharp reports of bombs were audible over the frontier. The Germans immediately replied by heavy fire on the aeroplanes. (See Admiralty announcement).

EGYPT

April 24—Aviator's Fine Work—There were some brushes with the enemy near Katia (East of Suez) yesterday. A report had been sent in that four hundred Turks were bivouacking in the neighbourhood of Katia, and last night and this morning the Flying Corps made an attack. Starting in darkness, the aeroplanes reached Katia as the sun was rising, and dropped a large number of bombs, completely dispersing the enemy with them and with the fire of their machine-guns. The casualties, it was seen, were heavy.

April 26—Bombs on Enemy Bivouacs—When the enemy's main body retired a force of 500 was left near Katia as a rearguard. Eight aeroplanes attacked their bivouac early on Monday morning (April 24), dropping seventy-one bombs on the encampment and absolutely destroyed it. The Turks were taken completely by surprise and lost half their number killed and wounded.

MESOPOTAMIA

April 19—Aircraft in the Desert—W. T. Massey, writing from Suez, in reference to expedition in the Sinai peninsula, where an enemy camp was destroyed, states: The aviators could see nothing of the enemy, for the Turks invariably rush into hiding on the appearance of an aeroplane. The plant and camp equipment were destroyed, the concrete foundation for an anti-aircraft gun was smashed, and the position, on which the enemy set store was thoroughly demolished.

April 24—The Turk in War—The following is an extract from a letter written by an officer in the relief force in Mesopotamia, which appeared in the *Times* recently: "One of our aeroplanes came down in the Turkish lines two days ago—both fellows killed. The Turks' aeroplane came over yesterday and dropped a message saying they were very sorry about it—but that it was the risk that aviators ran. It was a really nice message, showing they are sportsmen. I hear they treat our prisoners well—very well in fact. I don't think the Turk dislikes us at all—it seems a pity we have to fight him."

AN IMPERIAL AIR SERVICE

Lord Montagu was the chief speaker at a demonstration arranged by the Navy League at Queen's Hall on Friday, April 28, to urge on the Government the pressing necessity for more vigorous and comprehensive measures in relation to aircraft as an arm of national defence. A resolution was unanimously passed approving as the best means to that end the creation of a Board of Aviation under the control of an Air Minister with a seat in the Cabinet.

Mr. Robert Yerburgh, President of the Navy League, was in the chair.

Lord Montagu, commenting on the evils of the present system, said there was one very important branch of aerial warfare which had not even yet been definitely allocated to either of the great Air Services. On the naval side more vision had been shown than on the military side, in the matter at any rate of machines. Summarising the proposals he had submitted to the Cabinet, he said he would do away with the present titles of the Royal Naval Air Service and the Royal Flying Corps, and amalgamate them under the title of the Imperial Air Service.

It would be, he hoped, a service more Imperial in character than any existing service. He hoped to see its pilots drawn from all parts of the Empire, machines from our great sister nations, and planes building wherever the British flag floated to help to police the Empire. He would also include in the scheme the Anti-aircraft Service. He did not propose to interfere with the Executive in the present war. He proposed that the Board of Aviation should concentrate at first on problems of design, construction, and supply.

We must build special planes for reconnaissance, for patrol purposes, for long-range bombing, and for fighting. As soon as the Board of Aviation had met the needs of the Navy and the Army, it should have the independent power of starting long-range bombing expeditions. The Board should combine all the energies and abilities of the present staffs as much as possible. A man would be needed to carry this into effect. Whether he was called President of the Board of Aviation or Air Minister did not matter, but he must have equal weight in the Government of this country with the Minister who represented the War Office, the Admiralty, or any other of the great offices of State.

Scientific research should receive more consideration. The problems of aviation were yet only half solved, and we ought to spend tens of thousands, if not hundreds of thousands, of pounds a year upon experiments. The nation which first achieved a big discovery would have an enormous advantage. He was afraid a great deal of building was going on now without sufficient scientific research.

He saw no signs of opposition to the change proposed from any body of people in the country worth talking about. The opposition, as far as he could make out, was the opposition of a certain number of Ministers and heads of departments.

He had been asked if he was out for a job. If this or any other Cabinet were to ask him to act as the official head of military and naval aviation he would do it. He would put his whole heart, mind, and strength into the job. But he would equally serve under any other qualified person.

Concluding, Lord Montagu said: Clear your minds of the cobwebs of cant, of reliance on comfortable phrases, and realise the peril of ceaseless academic discussion and interminable departmental delay. A new day is dawning, but the clouds are blood-red over the coming sunrise. It may be for us a day of storm is coming or a day of splendour and glory. But there is no chance for the sluggard and dreamer. "The old order changeth." Realise that your sea power must now be reinforced by air power, and that without air power you will in future be defenceless, a tempting prey to an enemy impoverished, unscrupulous, but rich in scientific resources.

The problems of aviation are serious now and will become more and more important every day. Can they be solved by a system of divided administration and control? No. We must have concentration and unity. I ask you to send a clear message to the Government this afternoon. Tell them they must not stand trembling on the brink of decision, but that action must be taken.

The resolution passed by the meeting was moved by the Lord Mayor of Bradford and seconded by the Mayor of Kensington, supported by Colonel Faber.

MR. BILLING ON THE ROSTRUM

Mr. Pemberton Billing encountered some opposition at the Albert Hall on Saturday afternoon, when he spoke on our air policy. The large audience was mostly sympathetic, but a section interrupted sharply with charges that Mr. Billing was an "adventurer." Mr. Arnold White presided.

Mr. Billing, who had an enthusiastic reception, said that the running of the war should be transferred from the politicians to the soldiers and sailors. He suggested as an alternative to the present Government "An Imperial Nine," composed of one man from Australia, one from Canada, one from South Africa, a soldier, a sailor, an airman, a Conservative, a Liberal, and a Labour representative.

The Air Service had become the unwanted child of both the Army and the Navy, and both Services were too jealous to give it up. When the war came we were quite as unprepared in the air as in every other arm we possessed. During the first few months of the war, thanks to the splendid personnel of the Service, we had a few brief weeks of supremacy in the air, but we lost it directly the mechanical efficiency of Germany had an opportunity of operating, and we had lost it to-day. Germany was now first, and we were only a third-class air Power. Germany not only beat us, but the French, the Russians, the Italians, and what was left of the Belgians as well. If the war went on another year he would be very much surprised if the final blow was not struck with squadrons in the air.

He heard that Germany had launched her hundredth Zeppelin. Of course, many had been destroyed, but there were from 40 to 60 left. What was the Government doing in the circumstances? Could a Zeppelin raid be stopped? A Zeppelin shed at any rate presented a very good target, and he was echoing the opinion of most airmen in saying that it was where they were housed and built that they could be fought. If the Government would give our men the machines our men had the courage to go over to Germany, and carry the war into the enemy's country in the only way that was at present possible.

A resolution moved by Mr. J. Annan Bryce, and seconded by Mr. Kennedy Jones, in favour of an Imperial Air Service, was carried unanimously.

AIR RAID CASUALTIES

The following correspondence has passed between the Home Secretary and Mr. Pemberton Billing M.P., on the subject of the casualties resulting from air raids:—

Home Office, April 14.

Dear Mr. Pemberton Billing,—In the House of Commons yesterday you addressed a question to the Prime Minister in which it was alleged that the actual number of deaths from Zeppelin raids had been concealed from the public; and on the Prime Minister answering that there had been no such concealment you asked a supplementary question indicating that you had facts in your possession which would support the allegation. As the Home Office is the Department whose duty it is to collect from the local police the particulars of these casualties, I should be very much obliged if you would send me the evidence which has led you to believe that the number has not been correctly given in order that I may make inquiry.—Yours sincerely, HERBERT SAMUEL.

4, Elm Court, Middle Temple, E.C., April 18.

Dear Mr. Samuel,—In reply to your letter of the 14th, the particular case I had in mind when I put my question to the Prime Minister was X. On the occasion of a personal visit to one of the areas which had been devastated, the roads were closed and a policeman was in charge. In reply to my question as to how many people were killed here, the policeman answered "about two." I naturally challenged so vague a statement, and invited him to accompany me while I visited the ruined homes and adjacent houses. From subsequent conversations with residents it ultimately transpired that the number was greatly in excess of that stated by the constable.

I challenged the constable on his statements before leaving. He replied that he was obeying orders in giving the figure he had quoted. It is in the interests of public confidence that official figures should not be questioned locally, and when, as in this and other cases, the total casualties after a great raid fail to conform with local knowledge, it induces lack of confidence in official statements which is prejudicial to the public interest.

I should like to call your attention to the casualties which occurred at Y and Z. Should it be your intention to make public the actual figures, if you find the original official statements inaccurate, I shall be pleased to assist you with further information; but, as my sole object is to reassure the public, I should respectfully decline to engage in the matter unless I could be assured that publicity would be given to the result.—Sincerely yours, N. PEMBERTON BILLING.

Home Office, April 22.

Dear Mr. Pemberton Billing,—I have received your letter of the 18th in which you are good enough to supply me with the evidence on which you have based the grave charge that the Government have falsified the figures of casualties from Zeppelin raids.

With respect to the raid on the night of April 1, the official *communiqué* published two days later stated correctly that 16 deaths had been reported. All these were in X; there were no deaths elsewhere on that occasion. With respect to the attack on the night of March 31, the first estimate published on the following morning gave the number of killed as 28; 23 of these were at Y. Later information showed that this was an under-estimate. Two days later the total number of deaths had been ascertained to be 43, and this figure was at once published. Of these 28 were at Y. There were no bombs dropped at Z, and no deaths. The

numbers have since been increased by the deaths of a few among the injured.

The figures of casualties have always been collected with the greatest care and accuracy, and published precisely as received. I cannot refrain from saying that it is not a little mischievous that any member of the British Parliament should, from his place in the House of Commons, cast doubt on the truthfulness of statistics officially published, causing disquiet in the public mind and giving material for the propaganda of the enemy, which he will not be slow to use. But it is amazing that an accusation of this character should be made when it rests on no better foundation than a casual remark by a policeman in the street, which, as a matter of fact, may have been quite accurate in relation to the particular area to which it referred.

I would propose to publish this correspondence with the omission of the names of places.—Yours sincerely, HERBERT SAMUEL.

4, Elm Court, Middle Temple, E.C.,

April 24, 1916.

Dear Mr. Samuel,—In reply to your letter of April 22, I entirely concur with your suggestion that this correspondence should be published—when complete. I do not propose, here and now, to comment on the organisation—or the lack of it—which results in such discrepancies in the series of published casualty lists as those disclosed in your letter. Permit me to point out that in your anxiety to prove the innocence of the Government of the "grave charge of falsifying figures"—a charge which I never brought—you have confused the issue on the charge made in my question, to which I beg to refer you. My question was in these terms:—

"To ask the Prime Minister, whether it is with the sanction of the Government that the actual number of deaths from Zeppelin raids has been withheld from the public; and can he give an assurance that in future there shall be no attempt to conceal the total casualties."

For your information I may say that it was not "the casual remark by a policeman in the street," but the repeated statement of the policeman actually told off for special duty in this particular area, and he, when challenged on the inaccuracy of his figures, did not deny my total, but declared that his reply was according to instructions. It was in the particular area which this constable was told off to guard that I obtained an entirely different total of deaths. To complete this correspondence for purposes of publication it is advisable that I should visit in person or by representative the places raided, so as to obtain further corroborative evidence for your benefit. I have, therefore, the honour to request that I may be furnished by your Department with such permits as will allow me or any one responsible person agreed upon, to conduct on the spot, with the assistance of the local authorities, full inquiries into the true state of affairs, without the possible inconvenience of being arrested on some frivolous charge under the Defence of the Realm Act. I trust that the result of such inquiries will justify me in assuring the British public that present official policy is well advised, and that I may thus be instrumental in regaining for the Government that public confidence which the ever-increasing mass of my correspondence indicates to be grievously lacking.—Sincerely yours,

N. PEMBERTON BILLING.

Home Office, Whitehall, S.W.,

April 26, 1916.

Dear Mr. Pemberton Billing,—I waited from last Saturday, when my previous letter to you was sent by hand, until to-day, Wednesday, before sending the correspondence to the Press, but not receiving any answer I assumed that you did not propose to add anything and did not demur to publication, and it was accordingly issued to the Press Bureau. Subsequently I received your letter, which, although dated April 24 from the Temple, did not reach me until this evening. No facts have yet been advanced which would furnish ground for any official inquiry into the statistics of deaths from Zeppelin raids, and I fear I cannot see my way to confer upon you the authority of a Government Commissioner for the purpose of such an investigation. If, however, you will inform me what is the area in X to which you refer in your letter, what is the total of deaths which you describe as "my total," the date of your conversation with the policeman, and, if possible, his number, I will be glad to make inquiries in the locality. Should you desire it the remainder of the correspondence shall be sent to the Press.—Yours sincerely,

HERBERT SAMUEL.

STATEMENTS IN PARLIAMENT

HOUSE OF COMMONS

April 27—*The Air Service Debate*—Mr. Billing (Ind., East Herts) said the Prime Minister had very kindly promised Wednesday next for a debate on the Air Service. No one could accuse him of being indifferent to the Air Service, but he thought there was something more important than that, and that was the finding of men for the Army. He, therefore, thought it his duty to protest against the promised air debate being thrown to the House like a bone to haggle over, in order to hush up or hide or postpone the very grave question of recruiting.

PROGRESS AT THE FLYING SCHOOLS

The Grahame-White School—Straights with instructor: De Beer, Goodhart, Matthews, Rabourdin, Stapley, Sloden, Smith, Spencer, Bathurst, Burrell, Williams, and Forster. Circuits with instructor: Box and Scheidt. Ditto and eights alone: Franck, Hathaway, Leigh, Sandys, Kryn, and Timmis. Eights with instructor: Probationary Flight Sub-Lieut. Griffin. Brevet during week: Henshaw.

The Hall School—Since our last report the Hall School has taken five Royal Aero Club Certificates, and during last week the following pupils were receiving instruction after the short Easter vacation:—With Instructor P. G. Allen (late R.F.C.): Lieut. Armitage, Gaskell, Pennell, Collier, Robinson, Capt. Deane, Dickson, Rayne, Rand. With Instructor Anstey Chave (late R.N.A.S.): Cowney, Hooker, Rochford, Cosgrave, Smith, Duncan, Mahoney, Glegg, Milburn, Halliday. With H. F. Stevens: Dodds, Collins, Cook, Sepulchre. Royal Aero Club Certificates taken by: Lieut. Cooke, Arnsby, Sepulchre (test A), Collins, Cook.

CASUALTIES

ROYAL NAVAL AIR SERVICE

April 25

SERIOUSLY WOUNDED

Cleghorn, Flight Sub-Lieut. William F., R.N.

SERIOUSLY INJURED

Woolley, Flight Sub-Lieut. Sidney J., R.N.

ROYAL FLYING CORPS

UNOFFICIALLY REPORTED KILLED

April 23

Davies, Lieut. A. W., R.F.A., and R.F.C.

Lieut. Alan Wilmot Davies, R.F.A. and R.F.C., was killed on April 23 while flying on duty, aged 20 years. He was the younger son of Mr. and Mrs. J. H. W. Davies, of 25, St. John's Park, Blackheath, S.E.

UNOFFICIALLY REPORTED KILLED

April 24

Freeman, Second Lieut. J. E. H., Royal West Surrey Regt. and R.F.C.

Second Lieut. James Edward Hulton Freeman, Royal West Surrey Regt. and R.F.C., who was killed on April 24, aged 19, was the only son of Mr. and Mrs. Joseph Hulton Freeman, of The Holt, Walton-on-Thames.

April 25

Pemberton, Lieut. W. C., Canadian Infantry and R.F.C.

Lieut. Warren Coleclough Pemberton, of the Canadian Infantry and the R.F.C., was the second son of Mr. F. B. Pemberton, of Victoria, B.C. He was killed on April 25, aged 20 years.

WOUNDED

Undated

Moore, Lieut. G. H., Royal Berkshire Regt., attached R.F.C. McNaughton, Second Lieut. N. G., R.F.C.

PREVIOUSLY REPORTED MISSING, NOW REPORTED WOUNDED AND PRISONERS

Orde, Second Lieut. M. A. J., R.F.C.

Frost, Second Lieut. H. G., Suffolk Regt. and R.F.C.

Grimwade, Second Lieut. F. N., R.F.C.

PREVIOUSLY OFFICIALLY REPORTED MISSING, NOW UNOFFICIALLY REPORTED WOUNDED AND PRISONER

Castle, Second Lieut. J. S., R.F.C.

PREVIOUSLY OFFICIALLY REPORTED WOUNDED AND PRISONER, NOW UNOFFICIALLY REPORTED DIED OF WOUNDS AS PRISONER

Palmer, Second Lieut. C. W., R.F.C.

MISSING

Undated

Brown, Second Lieut. W. A. S., Argyll and Sutherland Highlanders, attached R.F.C.

Mortimer-Phelan, Second Lieut. W. C., R.F.C.

TWO WEEK-END FATALITIES

Second Lieut. A. Boag, of the London Regiment, attached to the Royal Flying Corps, was killed on April 29 while flying between Dorney and Windsor. He had only been attached to the Flying Corps about a fortnight, and this was his fourth flight.

A young Canadian aviator, Sub-Lieut. Liddle, R.N.A.S., lost his life while flying near London on April 30. He was in a biplane, and when over Edmonton, at a height of about 1,000 ft., the machine turned over, and fell to the ground, dropping in the goods yard of Angel Road Railway Station within about 30 yards of a signal-box. The aviator was dead when taken from the machine, which fell with such force that part of it, which buried itself in the ground, broke a water pipe laid 18 in. beneath the surface. Sub-Lieut. Liddle, who was 21 years old, was a native of Grimsby, Ontario.

DEATH OF CAPT. VICTOR BACON

On March 18 Capt. Victor Bacon was killed while flying over hostile territory. He was acting as observer in charge of the machine-gun on a 130 h.p. Farman biplane piloted by Sergt. Leroy, which formed part of the squadron which bombarded the aerodrome of Habsheim, near Mulhouse. His machine was attacked by an Albatross, and during the fight both machines caught fire, after which they collided—the collision being apparently intentional on the part of the French—and crashed down together on to the aerodrome from a height of 5,000 ft. Bacon was one of the most prominent and old-standing personalities connected with aviation in France, a true sportsman, a fine shot, and Vice-President of the Aéronautiques Club of France.

APPOINTMENTS

ROYAL NAVAL AIR SERVICE

Lieut.-Commander (R.N.):

R. C. Hayes, graded as Flight Commander, with seniority of April 3.

Lieut. (R.N.):

R. S. Robinson, graded as Flight Commander, with seniority of April 3.

Lieuts. (R.N.):

G. B. Chainey, T. G. Southwood, to *President II.*, additional, for R.N.A.S.: May 1.

The following Probationary Flight Sub-Lieuts. (temp.) have been confirmed in rank with original seniority as stated:

M. H. Spencer: September 4, 1915.

A. J. O'Reilly: October 25, 1915.

I. G. Kelly: November 23, 1915.

O. M. Ayrton, F. Towers: January 19.

G. M. Kingsmill: January 25.

W. E. McConnell: February 7.

T. R. Spence, J. W. Watson, T. C. Lloyd: February 24.

P. H. Hepburn: February 26.

N. H. Fletcher, W. J. Calderwood: March 6.

E. Ball: March 10.

B. P. Chase, C. A. Hervey, J. de Francia, W. A. Daniell: March 13.

J. Yates: March 29.

The following have been entered as Probationary Flight Sub-Lieuts. (temp.), with seniority of April 30, and all appointed to "President," for R.N.A.S.:

A. H. Munday, entered as Probationary Flight Sub-Lieut., for temp. service, with seniority of March 25, and appointed to the *President II.*, additional, for R.N.A.S.

L. G. Maxton, J. J. W. Nicholson, A. E. Taylor, E. E. Barnard, H. V. Rowley, I. P. Millar, G. H. D. Gossip, H. L. Nunn, J. D. Hewett, P. K. Fowler, W. Tod, W. B. Foster, E. A. Freeman, E. A. B. Tooth, H. S. Broad, E. L. Lister, W. Houston-Stewart, A. H. S. Lawson, C. Gilmour.

Probationary Flight Sub-Lieuts. confirmed as Flight Sub-Lieuts. for Temp. Service:

Ignatius G. Kelly: October 14, 1915.

Thomas R. Spence and John W. Walton: October 23, 1915.

Geoffrey M. Kingsmill: November 1, 1915.

Ormrod M. Ayrton: November 8, 1915.

William E. McConnell: December 10, 1915.

Jean de Francia: December 20, 1915.

Edward Ball: December 28, 1915.

James Yates: December 29, 1915.

Thomas C. Lloyd: January 4.

Walter J. Calderwood: January 15.

Claude A. Hervey: January 17.

Bertram P. Chase, Patrick H. Hepburn, Nigel H. Fletcher: January 25.

Wilfred A. Daniell: January 26.

ROYAL FLYING CORPS

The following appointments are made:—

Brigade Commander:

Temp. Lieut.-Col. Duncan Le G. Pitcher, 39th Cent. Ind. Horse, I.A., from a Wing Commander, R.F.C., and to be Temp. Brig.-Gen. while so employed: April 1.

Wing Commander:

Capt. (Temp. Lieut.-Col.) C. G. Hoare, 39th Horse, I.A., from Assistant Commandant, Central Flying School, and to retain his temp. rank while so employed: April 2.

Flight Commander:

Temp. Second Lieut. N. A. Bolton, General List, from a Flying Officer, and to be Temp. Capt. whilst so employed: April 6.

Equipment Officer:

Second Lieut. A. Heywood, S.R., from an Assistant Equipment Officer, and to be Temp. Capt. whilst so employed: April 2.

Assistant Equipment Officers:

Second Lieuts., Special Reserve, G. A. Curtis, R. M. J. Dunphy, W. J. Sinclair, A. F. Palmer: April 11.

Second Lieut. H. A. P. Bale, Hampshire Fortress Engineers, R.E., T.F.; Second Lieut. S. R. Proctor, S.R.: April 13.

Lieut. J. A. V. Noel, R.A., and to be seconded: April 14.

Lieut. L. Findlater, 3rd Manchester Regt., Special Reserve, and to be seconded: April 19.

To be Temp. Second Lieut.:

Second Lieut. N. W. Morrison, from R.F.C., Special Reserve, for duty with the Military Wing of that Corps: April 12.

SPECIAL RESERVE

Second Lieut. (on probation) S. R. Proctor is confirmed in rank; J. E. Appleyard to be Second Lieut. (on probation): April 15.

The following Second Lieuts. (on probation) relinquish their commissions:

J. J. Bland: April 1.

A. G. Grant: April 12.

E. HERTS ELECTION EXPENSES—Mr. Pemberton Billing's election expenses at East Herts amounted to £786 7s. 1d. Captain Brodie Henderson's expenses were £1,150 1s. 2d.

IMPERIAL AIRCRAFT FLOTILLA—In addition to £25,000 previously subscribed in the Straits Settlements and Federated Malay States for aeroplanes for the use of the Royal Flying Corps, Mr. C. Alma Baker, who is the organiser of the fund, and has himself already given two aeroplanes, has given yet a third, which is to be numbered Malaya 17.

ERECTING AND ALIGNING AVROS

An exceedingly useful and valuable booklet has just been issued by Messrs. A. V. Roe and Co., Ltd., dealing very fully with the erecting and aligning of Avro biplanes, Type 504. The book has been arranged with an idea of making it readily understandable for any air mechanic of average intelligence, and accordingly all the methods for truing-up have been described very fully.

With a view to making the book specially useful to those repairing machines, a number of original tables have been included, giving data which it is quite likely would be required at an air station where a complete set of spares for the machines are not available, and consequently the "next best thing" has to be used. Further, the book should be useful for instructing classes of recruits for the Services, and accordingly ease of reference has been kept in view when arranging the book.

The book is divided into seven stages; these stages are each divided into sections describing the adjustment of the machine in Front View, Side View, and Plan View; and each view again subdivided under Enunciation (statement of the required adjustment), Method (the obtaining of the adjustment), Check (giving where possible a suitable measurement), and Appliances. The whole arrangement is admirably clear and simple, and eminently suitable for rapid reference, while the drawings are all that can be desired.

Messrs. A. V. Roe inform us that they will be glad to supply a copy of the booklet to any responsible officer of the Air Services who may need one for instruction or other purposes and is unable to obtain one through official channels—viz., on application to the Admiralty or the War Office.

CONTROL OF PETROL SUPPLIES

The President of the Board of Trade has appointed Mr. Oliver Bury (chairman), Mr. Albert Edward Bowen, Sir John Prescott Hewett, G.C.S.I., and Mr. Philip G. L. Webb to be a committee to control the supply and distribution of petrol, and to consider what measures are necessary in the national interest—

1. To ensure that adequate supplies of petrol shall be available for the purposes of the war and for other essential needs;

2. With the above object to regulate the use of petrol for other purposes in the United Kingdom during the period of the war;

and, subject to the direction of the Board of Trade, to give executive effect to the measures decided on.

Mr. H. W. Cole, of the Board of Trade, will act as secretary to the Committee, whose offices will be at 29, Abingdon Street, Westminster, S.W. The Committee is not prepared to consider individual application for supplies of petrol, nor to deal with correspondence relative thereto.

PATENT INFORMATION

This list is specially compiled for AERONAUTICS by Messrs. Rayner and Co., Registered Patent Agents, of 5, Chancery Lane, London, from whom all information relating to Patents and Inventions, Trade Marks, or Designs, can be obtained gratuitously.

LATEST PATENT APPLICATIONS

5,472 H. Chitty. Propulsion of aircraft. 13/4/16.

5,489 W. L. Hamilton. Incendiary darts for aerial attack, aircraft. 14/1/16.

5,552 G. W. Mascord. Airships. 15/4/16.

5,311 F. J. Tippen. Engine more especially adapted to aircraft. 11/4/16.

SPECIFICATION ACCEPTED

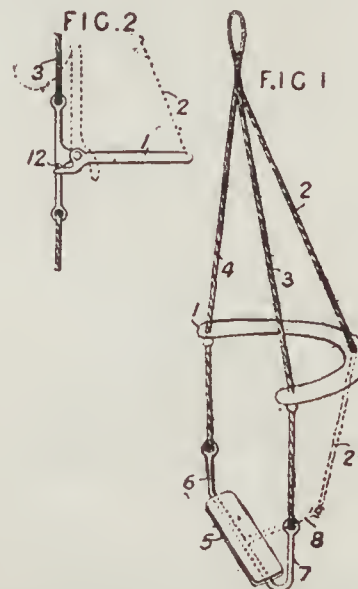
7,686 Christison. Aeroplanes and like aircraft.

SPECIFICATION PUBLISHED THIS WEEK

10,473 Martin. Aeroplanes.

LATEST PUBLISHED ABSTRACT

24,594 Aeronautics. E. R. Calthrop, Eldon Street House, Eldon Street, London. A trapeze for a parachute comprises a crescent-shaped bar, 1, forming an arm-rest and a seat, 5, on which the aeronaut sits astride. The supporting cords, 2, 3, 4, pass through the bar, 1, and



are attached to arms, 8, 7, 6, on the seat. The arm, 8, and the part, 2', of the cord, 2, may be dispensed with. A part of the space between the seat and the bar may be enclosed by a net or shield, in order to compel the aeronaut to sit astride on the seat. The bar, 1, may be pivoted to members, 12, in the suspension cords to permit folding.

Full copies of the specification can be obtained from Messrs. Rayner and Co., at the price of 1s.

COMPANY NEWS

REGISTRATION OF NEW COMPANIES

NEW WHITEHEAD AVIATION CONSTRUCTION CO., LTD.—Registered on April 13 with a capital of £130,000 in 100,000 preference shares of £1 each and 600,000 ordinary shares of 1s. each. To acquire and take over as a going concern (*inter alia*) the businesses carried on at Richmond, Surrey, as the Whitehead Aircraft Co., Ltd., and J. A. Whitehead, to carry on the business of manufacturers of, and dealers in, aerial conveyances and aircraft of all kinds and component parts thereof, builders and maintainers of hangars, garages, sheds, aerodromes, and accommodation for such conveyances and aircraft, mechanical and electrical engineers, machinists, fitters, etc. Registered office: 31, Towns Terrace, Richmond, Surrey.

DARRACQ MOTOR ENGINEERING CO., LTD.—The above company has been formed by A. Darracq and Co. (1905), Ltd., for the purpose of carrying on the business hitherto conducted at the Townmead Works, Fulham, London, S.W. The address remains the same as heretofore.

CHANGES OF ADDRESS

The address of the registered offices and works of the Integral Propeller Co., Ltd., after May 1 will be Edgware Road, The Hyde, Hendon, N.W., to which all correspondence should be addressed. The telegraphic address is "Aviprop, Hyde, London," and the telephone number Kingsbury 104.

In future all correspondence connected with the Aeronautical Department of Messrs. Boulton and Paul, Ltd., should be addressed to Messrs. Boulton and Paul, Ltd., Aircraft Works, Norwich.

THE MONOMETER TILTING FURNACE—A printer's error crept into the article on the Monometer Tilting Furnace which appeared in our issue of April 26. On page 276, in the third line of the second paragraph, the word "oil" should read "coke," as the furnace is supplied for oil, gas or coke firing to customers' option.

BOOKS RECEIVED

"ERECTING AND ALIGNING 80 H.P. AVRO BIPLANES, TYPE 504." Manchester: A. V. Roe and Co., Ltd., 1915. 40 pp., figs. and tabs. Price 1s.

AERONAUTICS

A WEEKLY JOURNAL DEVOTED TO THE TECHNIQUE OF AERONAUTICS

(FOUNDED 1907)

Edited by JOHN H. LEDEBOER, B.A., A.F.Ae.S.

VOL. X. No. 134 (NEW SERIES)

MAY 10, 1916

[Registered at the G.P.O.]
as a Newspaper

ONE PENNY

AIRCRAFT LOSSES IN THE WAR

ZEPPELIN LOSSES DURING APRIL-MAY

IT is certain that the Zeppelin menace, as carried out into execution, with all its tergiversations and perversions of the results attained on either side, has at last been reduced to its own level. The losses in Zeppelins have been heavy; the results attained have been from a military point of view extremely meagre. Yet the raids are increasing in the quantity, if not the quality, of the effort displayed as measured by their results. As a menace to the corporate being of England, as an attempt even against its industries, these German efforts—the sole ones that remained at their disposal to inflict injury and material damage upon our islands—have lamentably failed. It is reported, and upon excellent authority, that no fewer than nine airships participated in the last raid upon England and Scotland. These craft, after their fifteen-hour voyage to their so-called objective, succeeded by their cumulative effort in killing a few civilians. Per contra, on their return homewards at least one first-class dirigible was wrecked the next morning on the Norwegian coast, and its occupants, presumably, were interned. If not, we shall have to say something in the matter.

* * *

Again, a couple of days later one Zeppelin—apparently intent upon coastguard duty, was shot down by the guns of our fleet off the Schleswig coast and another brought down by naval artillery fire off Salonika. Three Zeppelins are thus definitely accounted for in three days, while a fourth is credibly reported endeavouring to return home in a damaged and crippled condition.

* * *

Some of the reports that are widely published in the daily press and are derived from neutral or enemy information—upon neither of which can we place reliance, since it is tainted more often than not—constantly adduce circumstantial evidence of other German aircraft losses with which we are not concerned, knowing as we do the origin of these reports. Nevertheless, basing our analysis on such losses as we know from official news and enemy bulletins to have actually occurred, and omitting ordinary losses which must perforce and under the law of probabilities have been incurred by the Huns in what may be termed their more peaceful avocations behind the fighting lines, we have to register during the first three months of the year the total loss and destruction of no fewer than seven Zeppelins (always assuming that the German airship destroyed at Salonika belonged to this category). These losses included, so far as we know from our side of the theatre of war:

- L 19—sunk in the North Sea, Feb. 2,
- LZ 77—destroyed at Révigny, Feb. 21,
- L 15—sunk off the Thames, April 1,
- L 20—destroyed at Stavanger, May 3,
- L 7—destroyed in the North Sea, May 4,
- L —destroyed at Salonika, May 5, and
- L 9—damaged in the North Sea, May 6. (?)

By the end of last year we registered in our columns, after an exhaustive analysis, a loss of sixteen Zeppelins since the beginning of the war—i.e., from August 4, 1914, to December 31, 1915—apart from losses of these craft which were either unconfirmed or took place behind the German front, and thus went unrecorded. To that we now have to add the destruction of five of these giant aircraft since the beginning of this year—a total bag of 22 German airships of capital size and modern armament. After 21 months of warfare we know therefore that the Germans have lost 22 modern airships at a moderate computation, being based as it is purely on official reports and German official acknowledgment of losses.

* * *

Now, I state with a full sense of responsibility that the utmost present output of the German airship factories, apart altogether from housing accommodation—a far more important and lengthier problem—cannot at an outside estimate amount to more than one full-rigged airship of capital size per month. A simple sum of addition and subtraction will therefore prove conclusively that the Germans have lost during the war at least as many airships as they have built or can build. If the wastage goes on proportionately, as it must if adequate results are to be secured, we simply hold the German airship fleet in our hand. To speak plainly, if the Germans, with an expenditure of money which is well-nigh incalculable, amounting as it does to several scores of millions, have only been able to inflict upon us damage to the extent of a few thousand pounds, and that by inflicting upon themselves material losses of several million pounds, where remains the Zeppelin menace? As we have often remarked, the Zeppelin menace is non-existent provided we realise in practice our obvious means of countering it: the destruction of the Zeppelin in its lair, and the recognition of the broad strategical truth insisted upon for years past in these columns that our first line of defence, as far as these islands are concerned, lies off the enemy's shore and over the intervening waters of the North Sea.

One more interesting fact remains to be noticed by students of aerial history. In our list of Zeppelin losses published in our columns of January 12, 1916, we included the loss at sea of L 7 (January 23, 1915) and of L 9 (March 5, 1915), the latter being officially admitted by the German Admiralty. If this previous information was correct—and there is no reason to doubt the fact—this simply proves that destroyed naval dirigibles are replaced at the earliest opportunity by other and newer craft bearing the same designation and number—an old Hun trick. Apart from this fact, which is interesting chiefly to aerial students, the whole point of the developments in the air of the last few weeks is the proof positive that we are, at least, able to hold our own.

Aeroplane Losses of Both Sides

In another column we give our monthly compilation of the Allied and German aeroplane losses along the Western front. Losses in the other theatres of war are omitted, as usual, in view of the lack of anything in the nature of accurate or reliable data. A comparison of our figures, which have been carefully abstracted from the official *communiqués* of both sides and subsequently analysed, will show that not only are the respective statements grossly at variance one with the other, but that the final official estimates in no way coincide with the totals derived from the daily bulletins. As we have remarked before, there must perforce be much uncertainty in estimating the enemy's aeroplane losses, however scrupulously fair may be the reports of the pilots engaged; hence we have endeavoured throughout to disentangle certain losses from suppositious ones, and in each case have given the enemy the benefit of the doubt.

* * *

Dealing, first, with the British portion of the front in Flanders and Northern France. During the month of April we brought down behind our own lines in aerial battles seven Hun aeroplanes, while the same number of machines were shot down and fell (excluding uncertain cases where the official phrase refers to machines as merely having been "driven down") behind the enemy's lines. A further seven Huns were destroyed upon strong presumptive evidence, though their precise fate remains uncertain. Total, 21 German machines definitely accounted for. It should be noted that only a single enemy machine was brought down by our anti-aircraft guns.

* * *

Analysing the German daily *communiqués* (which certainly do not err on the side of truth), we find that they claim to have shot down behind our lines four British machines—all by means of gun-fire from the ground—and only three in their own lines; the fate of three others which they claim is not specified. Total, 10 British machines out of action. The German summary of the month's aerial fighting does not differentiate between British and French machines, but lumps them together as "enemy aeroplanes"; while for some incomprehensible reason, in view of our undoubted superiority maybe, British Headquarters have issued no monthly summary.

* * *

Turning to the French portion of the front. In view of the heavy fighting round Verdun, where the majority of the encounters have taken place, the losses on both sides are here considerably greater. Let us take the French daily reports first. Twelve Huns were brought down or forced to land behind the lines of our Allies; eight Huns were brought down behind the enemy's lines; according to the wording of the official reports, the precise fate of twelve further German aeroplanes which were definitely destroyed was uncertain. Total, 32 enemy machines accounted for, of which four were brought down by artillery fire. This figure is closely akin to that of 31 given in the French official summary, though the details vary, it being stated that nine machines fell in the French lines and 22 in German territory; but the divergence is unimportant in view of the uncertainty already referred to.

* * *

Turning to the daily German *communiqué*, we find that they claim to have accounted for 11 French aeroplanes brought down in the French lines, 6 in their own, with 5 others uncertain. Total, 22, of which four were shot down by artillery. Add these to their claims in regard to British machines, and we arrive at a combined total of 32 Allied aeroplanes brought down, as against the combined Allied claims of a bag of 53 Huns. On the other hand, the monthly German summary widely differs, as might be expected, from the figures. It claims to have brought down 26 "enemy" aeroplanes (only two of them into their own lines) by fighting and a further 10 by artillery fire, or a total of 36, and

admits the loss of 22 craft. Again, the French admit the loss of six of their machines in the German lines, which coincides with the German claims.

* * *

For the sake of convenience these respective claims may be summarised in tabular form:

	IN OWN LINES	IN ENEMY LINES	UN- CERTAIN	TOTAL
British claims	7	7	7	21
French „	12	8	12	32
German „	9	15	8	32

The discrepancies between these rival claims of the published official summaries have already been pointed out. It is surely desirable from every point of view that our own authorities should imitate the example set by the French and the Germans and publish an official monthly summary, but in such a form that it can be accepted as reliable without the least question, and this the more so since, for all the German quibbles, it is quite clear that during the past month our superiority has once again been asserted beyond doubt or cavil.

Meteorology at the Front

According to French and German official statements, a score or so of French captive balloons broke away from their moorings during the "gale" which raged on Friday, May 5. The freed balloons drifted towards the German lines, but the majority of the observers succeeded in alighting in their own territory by utilising the parachutes with which, as stated some weeks ago in our columns, they are now provided in case of an emergency of this nature. According to the enemy report, fifteen French balloons were captured, presumably *minus* the observers. This extraordinary occurrence gives rise to a reflection of a grave order, and indicates a state of inefficiency in one department, at any rate, of the otherwise admirable aerial organisation of the French—an organisation which for perfection of detail and equipment leaves our own, let us admit it candidly, well behind. Let it be stated frankly that a mishap of this nature on such a large scale would have been a matter of utter impossibility given an intelligent and efficient meteorological service—a lesson which it behoves us to take to heart. Violent storms are not spontaneously generated; they invariably give adequate preliminary warning of their approach, even though they be of a local nature; and had such warning been given—as it should have been—there would have been ample time to wind in the observation balloons, and a considerable loss of valuable material, not to mention personnel, would have been prevented. It is to be feared that the Allies have not yet realised to the full the extraordinary mechanical character of this war, in which every single branch of science plays its own part. The ultimate issue may, it is true, be settled by man-power, as the military critics, only too often fashioned in an antiquated school, insist at wearisome length; but meantime science holds the upper hand, and it is high time (for more reasons than one which scarcely lend themselves to detailed examination at present) that the meteorological services which form an adjunct to the scientific equipment of a modern army in the field, which will assume an ever-growing importance as aerial warfare extends, should be brought to a higher pitch of efficiency. The present instance is a forcible case in support of this contention, but so was the abortive raid on the Schleswig coast and more than one unsuccessful gas attack. The advantage in this respect, be it remembered, lies with the Allies, who have at their disposal the full meteorological information from the western seaboard, from these islands, and from the Atlantic, on which alone accurate weather forecasts can be based. Of this priceless meteorological advantage we have deprived the Hun; at any rate, then, let us see to it that we draw from it to the full such benefits as it is able to confer upon us.

J. H. L.

GERMAN AIRCRAFT LOSSES ON THE WESTERN FRONT, APRIL, 1916

BROUGHT DOWN BY BRITISH

April 1—Two hostile aeroplanes were driven down behind the German lines.

„ 2—One of our aviators shot down a German machine in the neighbourhood of Lens.

„ 3—A German machine was shot down by one of our aviators behind our lines south of Souchez. The pilot and observer were both killed.

„ 8—A Fokker monoplane came down in our lines. The pilot was taken prisoner and is un wounded.

„ 10—Our machines drove down one of the enemy's without sustaining any loss.

„ 23—One of our fighting machines attacked an enemy aeroplane and drove it down. The hostile machine, when last seen, was close to the ground and out of control (Admiralty report).

„ 24—A hostile aeroplane was brought down by anti-aircraft gunfire near Ploegsteert. Pilot and observer killed.

„ 24—A British aeroplane attacked an enemy seaplane about five miles off Zeebrugge. The enemy pilot was

April 4—In the region of Verdun our pursuing aeroplanes brought down a German aeroplane with two engines near the pool of Hauts Fournaux; another enemy machine fell near the Bois de Tilly; while a third fell vertically to the ground.

„ 8—One of our pilots in the Verdun region brought down a Fokker, which fell in our lines near Esnes.

„ 9—Another Fokker was brought down by the fire of our special guns. The machine fell in the Woevre in the German lines. A third Fokker landed in Champagne. The machine was intact; its pilot was captured.

„ 11—One of our pilots brought down a German aeroplane, which fell in our lines near Badonvillers. The two enemy aviators were killed in their fall.

„ 25—Near Vauquois an enemy aeroplane was forced to land in his lines after a fight and was destroyed by our gun-fire. In the region of Verdun one of our chasing aeroplanes brought down a German aeroplane, which fell on Poivre Hill, 50 yards from our trenches. A third machine brought down by one of our



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killed and the machine dropped, the enemy observer falling out while the machine was still at a height of 3,000 ft. The hostile seaplane crashed into the sea and sank (Admiralty report).

April 24—Two hostile machines were seen to fall to the ground in the German lines.

„ 26—This morning a hostile aeroplane was brought down in our lines as a result of a fight in the air. Both pilot and observer were killed.

„ 27—One hostile machine down.

„ 28—Four enemy machines were driven down, one landing in a ploughed field.

„ 29—Two German aeroplanes were brought down behind our lines.

„ 30—One hostile machine was driven down in the enemy's lines, and a second, while being pursued, got out of control and fell on the roofs of Bapaume.

BROUGHT DOWN BY FRENCH

April 3—Near Noyon a German aeroplane fell in our lines; the aviators were captured.

„ 3—In the region of Verdun our airmen brought down four German machines. (Other enemy aircraft were put to flight or forced to come to earth.)

pilots fell in the Forges Wood. Finally a Fokker, riddled by machine-gun fire by one of our aviators, dived vertically in the region of Hattonchatel.

April 26—An Aviatik which had lost its way landed last night in our lines, in the environs of Rosières. Its two officers were taken prisoners. An enemy aeroplane, shelled by our anti-aircraft guns, fell in flames in the direction of Bagatelle-Pavillon, north of the Four de Paris. One of our pilots, after an aerial engagement this morning, brought down a Fokker, which fell in our lines near Hoéville, north of Lunéville. The enemy aviator, who was wounded, was taken prisoner. An enemy aeroplane, brought down by the fire of our motor guns, fell in front of the Fort of Vaux.

„ 27—One of our pilots brought down an enemy aeroplane, which fell headlong into the forest of Spincourt (north of Verdun). An enemy aeroplane was brought down in the region of Fromezey. Two other enemy machines, attacked by ours, were brought down seriously hit—one near Douaumont and the other in the Bois de Montfaucon. In the region of Nesles-Chaulnes a Fokker fell vertically in the German lines.

„ 30—An Aviatik was forced to come down in the valley of the Biesne. The machine is undamaged, and

the two officers who occupied it were taken prisoners. One of our aircraft attacked two Fokkers over the German lines in the region of Roye. One of the two machines was shot down by machine-gun fire from a height of 5,000 ft. and was smashed to pieces; the other was obliged to land. Two other Fokkers were brought down—one near Les Eparges, the other south of Douaumont. Two enemy machines were brought down south of Verdun, and a third by our special anti-aircraft guns.

GERMAN CLAIMS

BRITISH MACHINES BROUGHT DOWN

April 2—An English biplane was shot down near Hollebeke, and the occupants were taken prisoners. South-west of Lens an enemy aeroplane was brought down in flames by a direct hit from our anti-aircraft guns.

„ 10—An enemy aeroplane was seen to crash to earth in the village of Loos, and another in the Gaillette Forest.

„ 11—Two enemy aeroplanes were brought down south-east of Ypres by means of our anti-aircraft guns.

„ 17—Near Pervyse (Flanders) our anti-aircraft guns shot down an enemy aeroplane just behind the Belgian lines. Our artillery destroyed the aeroplane. First-Lieutenant Berthold brought down a British biplane north-west of Péronne. The pilot was dead and the observer was seriously wounded.

„ 24—A British biplane was brought down in an aerial fight east of Arras. The officers were captured.

„ 27—In air fighting one enemy aeroplane was shot down near Souchez, and another south of Tahure, and a third by our anti-aircraft guns south of Parroy.

FRENCH MACHINES BROUGHT DOWN

April 1—Our battle aeroplanes have shot down four French aeroplanes—one each near Laon and Mogeville, which fell within our lines, and also one each near Ville-au-Bois and south of Haucourt, which came to earth direct behind the enemy line.

„ 10—One French aeroplane was shot down to the south-east of Damloup and one north-east of Chateau-Salins. The occupants of the former are dead.

„ 12—In an air fight a French aeroplane was brought down near Ornes, in the Woëvre. The pilot was killed.

„ 21—An enemy aeroplane fell down during the fighting at Fumin Wood, south-west of Vaux.

„ 25—An enemy aeroplane was brought down by our anti-aircraft fire near Tahure and was destroyed. Another machine was brought down to the east of the Meuse; this somersaulted to earth.

„ 26—Two enemy aeroplanes were shot down in an aerial fight above Fleury (south of Douaumont) and west thereof.

„ 28—Two enemy machines came down west of the Meuse, one over Bethelainville and a second near Very. A third machine was brought down by our anti-aircraft guns near Frapelle, east of St. Dié.

„ 30—Our anti-aircraft guns brought down a French biplane south of Moronvilliers, in Champagne. First-Lieutenant Boelcke shot down, south of Vaux, his 14th enemy aeroplane. During an aerial battle over Verdun and Belleray a German aviator shot down one machine.

May 2—It has now been reported that two French aeroplanes were brought down in aerial battles on April 30—one over Chaume Fort, west of Verdun, and one over Thierville Wood, south-west of the town.

A NOTE ON THE ECONOMIC SELECTION OF AERONAUTICAL MATERIAL

CONSIDER two materials, *A* and *B*, both of which are apparently equally suited to withstand a certain direct stress. Indirect stresses—*e.g.*, the bending of a strut under load—are for the sake of simplicity eliminated from these considerations.

A. Safe working load/weight ratio=*m*.

B. Safe working load/weight ratio=*m*.

Density of *A* : Density of *B* :: 4 : 1.

Although the weights of the respective materials necessary to withstand equal stresses will be identical, the member of *A* material will occupy but one-fourth of the space occupied by the member of *B* material. Thus the head resistance or detrimental surface of the member *A* will be approximately half that of the member *B*. Hence *A*, the denser material, is the more economical. It is apparent, then, that an expression other than strength/weight is desirable for the selection of materials for members offering detrimental resistance in the line of flight.

A resistance of 1 lb. weight added to an aeroplane of gliding angle 1 in 8 is equivalent to the addition of 8 lb. in weight. Hence, instead of the formula *S/W* in the selection of materials, it is proposed to employ *S/W + w*, where *w* is the equivalent weight of unit volume of the material in the same units as *W*. By equivalent weight is meant the weight equivalent to the head resistance as determined from a knowledge of the gliding angle. It is necessary, then, to find an expression for *w*.

Consider a tension or compression member of any good stream-line form.

$$\text{Cross-sectional area} \propto \frac{1}{\text{safe working load.}}$$

$$\text{Resistance} \propto \sqrt{\text{cross-sectional area.}}$$

$$\therefore \text{Resistance} \propto \frac{1}{\sqrt{\text{safe working load.}}}$$

The head resistance of a strut may therefore be expressed as

$$R = \frac{KV^2l}{\sqrt{S}}$$

where *R*=resistance of strut,

V=velocity,

l=length of strut,

S=safe working load,

K=constant depending on the strut form, etc.

If the gliding angle of the machine is 1 in *x*, the equivalent weight of the strut is $K \cdot V^2 \cdot l \cdot x / \sqrt{S}$. Now the volume of the strut is given by the product of cross-sectional area and length, and may be expressed as $c \cdot l / S$, where *c* is a constant. The equivalent weight of unit volume of the strut is therefore given by the expression :

$$w = \frac{K \cdot V^2 \cdot x \cdot \sqrt{S}}{c}$$

The formula for the economic selection of material thus becomes :

$$\frac{S}{W + \frac{K \cdot V^2 \cdot x \cdot \sqrt{S}}{c}}$$

$$\text{i.e. } \frac{cS}{cW + KV^2 x \sqrt{S}}$$

The values of *c* and *K* are both determinable from a knowledge of strut resistances.

THE PITOT TUBE AND THE INCLINED MANOMETER *

By J. C. HUNSAKER

FOR aeronautical purposes the absolute measurement of velocity is of less importance than the measurement of impactual pressure. For this reason an anemometer from which the velocity may be deduced from a pressure measurement is preferable to any of the vane anemometers which measure velocity directly, and require a somewhat laborious calculation of the density of the air before the effect of the wind can be evaluated.

The most common as well as the most convenient form of pressure anemometer is the double Pitot tube. Reference may be made to the papers of Taylor † and Zahm, ‡ in which it is shown that the equation to a stream line in any perfect gas may be simplified in the case of air by considering the air incompressible for velocities below 100 feet per second. The simplified expression connecting pressure and velocity in moving air is then Bernoulli's equation as used in hydraulics :

$$\frac{\rho v_1^2}{2g} + p_1 = \frac{\rho v_2^2}{2g} + p_2,$$

where v_1 and p_1 are velocity and pressure at any point, and v_2 and p_2 are corresponding values for some other point in the same stream line.

Let us choose the point where v_2 is zero, then

$$\frac{\rho v_1^2}{2g} + p_1 = p_2.$$

In air this is the barometric pressure. Let us change the notation so that $\frac{\rho v^2}{2g} + p = p_0 =$ barometric pressure, a constant.

p is now the pressure in the unchecked stream, the "static" pressure, and p_0 is the pressure in the impact tube where the current is brought to rest. This is called "dynamic" pressure.

The Pitot tube is a device for transmitting the pressure difference, $p_0 - p = \frac{\rho v^2}{2g}$, from which the velocity may readily be calculated. The quantity $\frac{\rho v^2}{2g}$ is commonly called "velocity" pressure.

If one end of an open tube be pointed into a stream of air and the other end be attached to a manometer, the total dynamic pressure will be recorded. On the other hand, if a tube with closed end be pointed into the wind and further fitted with a conical or parabolic tip, the stream line is only slightly deflected and distorted. If then small holes or slots be cut in this tube at a distance well back from the tip, the wind should blow past these openings and the interior of the tube should be subjected to the static pressure of the stream. This pressure can be measured by connecting the tube to a manometer.

It is generally accepted from the results of tests that any open-ended tube of any size, if pointed fairly into the wind, will correctly transmit the dynamic pressure.

It is equally common knowledge that the correct transmission of the static pressure is not so simple. Widely different values are obtained with different forms of tube and static orifice, and many tubes, such as the Dines and the Recknagel, must be calibrated against some standard. It is obvious that the nose of the tube should be of easy form, that the tube should not be large in diameter, and that it should be carefully polished in order that the air

stream may pass undisturbed. The best form of entrance will introduce some disturbance, so that such static openings as are used should be placed well back from the nose on the cylindrical portion. The form and size of the openings will be discussed later.

The Pitot tube may consist of two separate tubes or a double tube made up of a pair of concentric tubes, the dynamic tube being enclosed within the static tube. Since the dynamic tube transmits the pressure $p + \frac{\rho v^2}{2g} = p_0$, and

the static tube transmits p , it is sufficient to connect the two tubes to the two ends of a U-tube filled with liquid. The reading of the instrument is then proportional to the difference between the pressures transmitted and hence to $\frac{\rho v^2}{2g}$. Knowing the density, the velocity may be computed.

The density of air depends on the pressure, temperature, and humidity. Avoidance of the necessity for calculating the density for ordinary aerodynamical tests would be of great assistance.

ELIMINATION OF DENSITY OF AIR

It is generally accepted that the forces produced by a fluid in motion with reference to any solid object depend on the size, shape, and attitude of that object, the velocity, the density of the fluid, and its viscosity, and upon nothing else for ordinary transportation speeds.

The most general expression § for this statement which satisfies the theory of dimensions is

$$R = \rho L^2 V^2 f\left(\frac{VL\rho}{\mu}\right)$$

in which

L denotes the length of any linear dimensions of the solid ;

V the relative velocity of solid and fluid ;

ρ the density of the fluid ;

μ the coefficient of viscosity of the fluid, and

f is a function of the single variable $\frac{VL\rho}{\mu}$.

It will be noted that the compressibility of the fluid has been neglected.

The value of $f\left(\frac{VL\rho}{\mu}\right)$ is very nearly constant for bodies of a given shape in a given orientation when the motion of the fluid is sufficiently turbulent. Experimentally it is found that $R \propto V^2$, nearly, and hence not only is $f\left(\frac{VL\rho}{\mu}\right)$ nearly constant, but the influence of viscosity is small. The changes in $f\left(\frac{VL\rho}{\mu}\right)$ with change of scale, density, and viscosity are hence in the nature of a correction.

For objects moving through the air at very low speed, especially objects of easy form, turbulence is not marked and viscosity is of importance. Consequently for such tests the assumption of f constant is not justified.

However, for aeroplane wings, parts, etc., moved through the air at high speeds, the resistance to motion is largely due to turbulence, R varies nearly as ρV^2 and $f\left(\frac{VL\rho}{\mu}\right)$ is constant nearly. Therefore we may assume that for the ordinary work of an experimental wind tunnel forces to be measured will vary as the density of the air. Likewise the manometer reading obtained from a Pitot tube will vary as the density of the air.

* "Reports on Wind Tunnel Experiments in Aerodynamics," Smithsonian Collection. The first article appeared in AERONAUTICS, March 8.

† Experiments with Ventilating Fans and Pipes, by D. W. Taylor, Naval Constructor, U.S. Navy, Trans. Soc. Naval Architects and Marine Engineers, 1905.

‡ Measurement of Air Velocity and Pressure, A. F. Zahm, Ph.D., Physical Review, December, 1903.

§ Helmholtz, Wissenschaftliche Abhandlungen, Vol. I., p. 158; O. Reynolds, Phil. Trans. Roy. Soc., 1883, p. 935; Lord Rayleigh, Phil. Mag., 1899, p. 321.

It has been decided to adopt a standard density for air to be used throughout. Velocity computed from a manometer reading is then referred to this standard air, and forces measured on the balance are referred to the same standard. Standard air is taken to be dry air under the following conditions:

Barometric pressure, 29.921 inches mercury.

Temperature, 62 degrees Fahrenheit.

Density, 0.07608 pound per cubic foot.

COMPARISON OF PITOT TUBES

Opportunity was taken to compare the National Physical Laboratory standard Pitot tube, calibrated by Bramwell,* with several forms of tube in use by engineers in the United States.

The tube under investigation was mounted in the centre of the tunnel and connected by rubber tubing with a Chattock micromanometer. Care was taken to eliminate

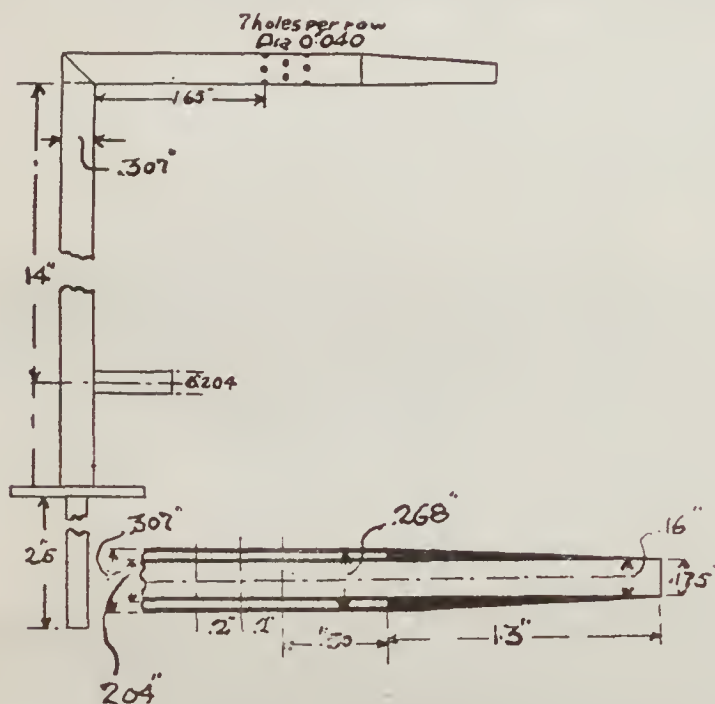


FIG. 3.—N.P.L. tube

leaks in the leads, and to point the tube parallel to the axis of the tunnel. A steady wind was then blown through the tunnel and its velocity read from the alcohol gauge connected with the side suction plate which had already been calibrated as described in a previous paper. The velocity from the side plate was then compared with the velocity indicated by the Pitot tube under test. Comparisons were made at a number of speeds for each tube.

It was demonstrated that the velocity is correctly

were not pointed fair into the wind. The size of the tube appeared to be immaterial.

The results of comparison of three tubes with different arrangements of holes from 4 to 24 in number are shown on figure 6. The tubes are shown on figures 3, 4, and 5.

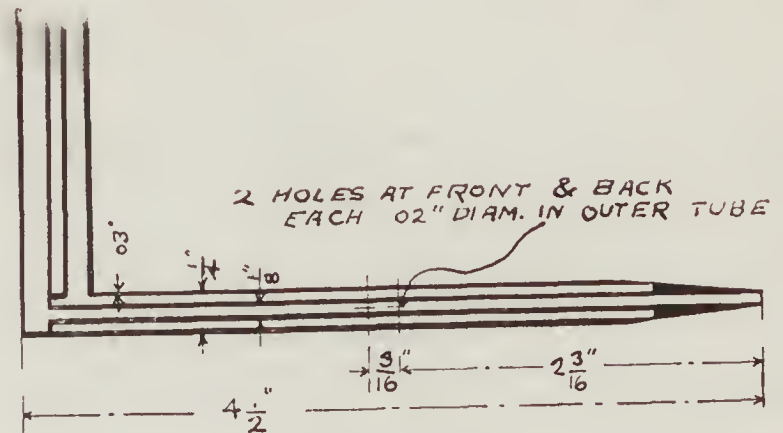


FIG. 4.—A. B C. tube

The agreement is very close—within $\frac{1}{2}$ per cent. at velocities above 10 miles per hour.

Tests were made to determine the effect of inclining the tubes to the wind. The tubes with holes show an error of but 1 per cent. for an inclination of 4 degrees. The results are shown in figure 7.

The following conclusions may be drawn from these tests :

1. Static openings should be small holes about 0.03 inch in diameter to minimise effects of bad alignment or turbulence.
2. An error of 2 degrees in aligning the tube causes no important change in velocity reading.
3. If a tube is correct at two speeds it remains correct at all others within the range of our experiments.
4. Holes should be symmetrically distributed on the cylindrical portion of the tube.
5. Any new type of tube should be calibrated against a standard.

THE INCLINED MANOMETER

Granted that a Pitot tube is at hand which will correctly transmit the static pressure, measurements of velocity are no better than the manometer used. The ordinary U-tube filled with water, petrol, alcohol, or other light liquid shows a head of less than 1 per cent., it would be necessary to read the displacement of the meniscus to within 0.01 inch. This is hardly practicable, and various devices are used to magnify the reading. It is at once apparent that if the U-tube be canted at an angle of 1 in 20, a 1-inch head of liquid corresponds to 20 inches on the scale. With an

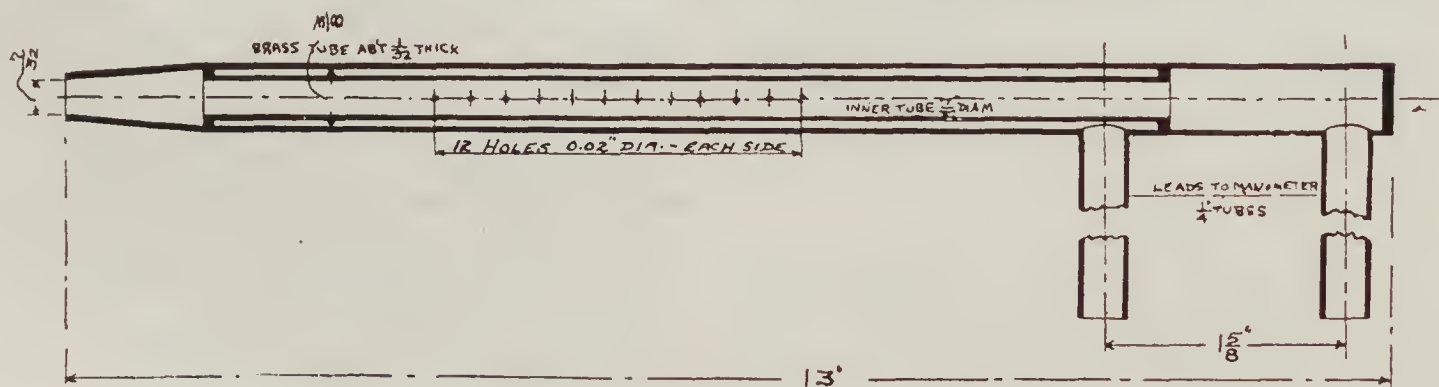


FIG. 5.—Tube A.

measured by any tube having an easy entrance and a long cylindrical portion parallel to the wind in which a number of small holes are drilled to transmit the static pressure. The arrangement of the holes appeared to have no effect. Long slots in the tube introduced large errors if the tube

inclined tube, the diameter of the tube must be kept small in order to obtain a good meniscus for reading. On the other hand, in any gauge in which the imperfections in the glass produce changes in capillarity, the liquid sticks at some places. A large tube tends to reduce this source of error. The American Blower Company recommend an inclined U-tube filled with petrol for use with the Pitot

* Technical Report of the Advisory Committee for Aeronautics, London, 1912-13.

tube. This type involves the simultaneous reading of the meniscus level in each leg of the tube, a somewhat difficult feat in an unsteady current.

The German "Krell" manometer is filled with alcohol coloured to give a visible meniscus. One leg of the U-tube is an inclined glass tube, and the other is a reservoir bottle whose section is some 400 times the section of the tube. Hence as liquid rises in the glass tube the depression in the reservoir is unimportant. Only one meniscus level then need be read.

An inclined tube manometer on the Krell principle was constructed, and an investigation made of its errors by comparing it with a Chattock manometer known to be nearly correct. This alcohol manometer is shown in figure 8. It is seen to include a reservoir *R* mounted on a hinged plate with levelling screw. By means of the latter the liquid in the tube is brought to the zero of the scale at the

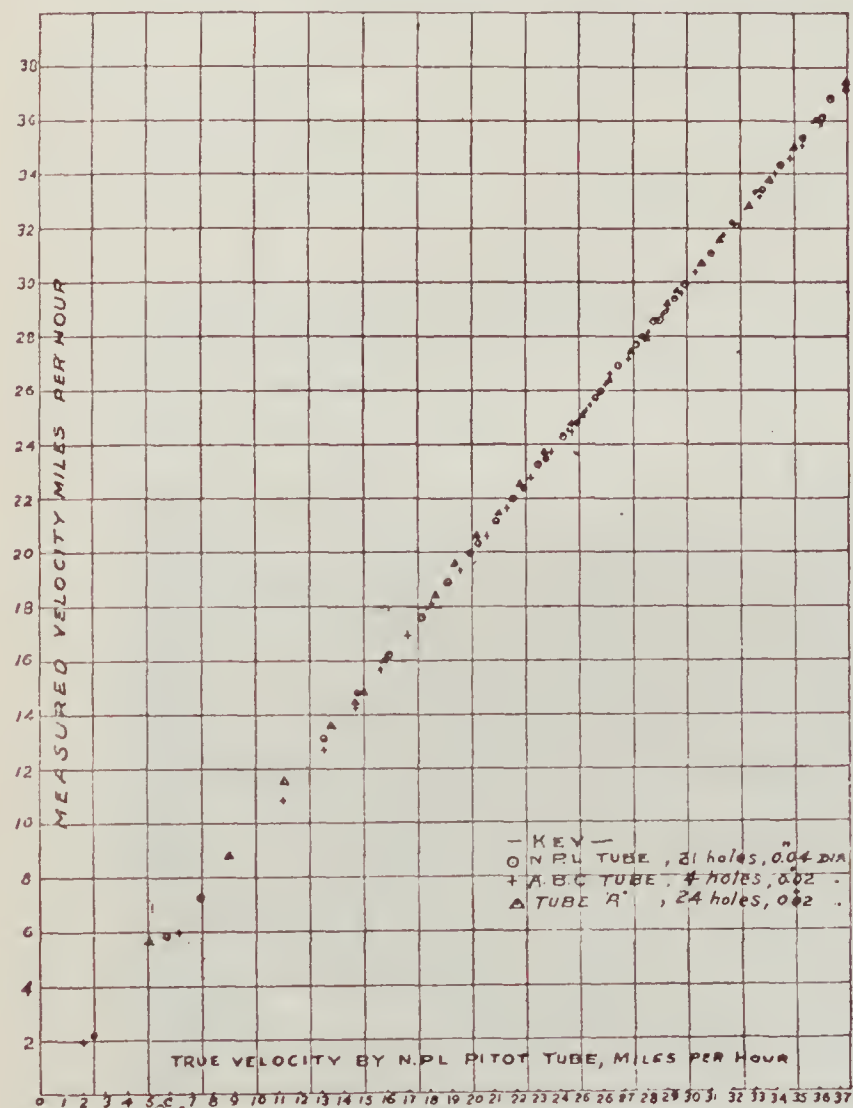


FIG. 6

beginning of a test, thus making a zero correction unnecessary. The glass tube, *T*, is likewise mounted on a brass plate pivoted at the knife edge, *K*, and adjusted in pitch by the screw, *S*. To the brass plate are attached permanently two small machinists' spirit levels, *L*₁ and *L*₂, set at 3 degrees and 6 degrees to the axis of the tube. The corresponding pitch is roughly 1 in 10 and 1 in 20. For a low velocity measurement (below 30 miles per hour) the screw, *S*, is turned until the level *L*₁ shows horizontal. The tube is then inclined 3 degrees. The instrument is thus quite independent of the levelling of the table or bench on which it may be used. Connection between the reservoir and glass tube is made by a short piece of rubber tube. Displacement of the liquid in *T* is read on a scale of 600 half skilful instrument maker, and great care was taken to set the spirit levels at the correct angles. The best grade of German glass tubing was used, and each tube was carefully cleaned with strong sulphuric acid and potassium bichromate.

If there are no appreciable errors in the levelling, the correct head of liquid (alcohol, 95 per cent., stained red with fuchsine dye) is given from the geometrical construction. Thus: head of liquid = displacement of *T* × sine of inclination. A small correction can be made for the depression of the liquid in *R* as the level in *T* rises. This also can be computed from the dimensions.

The density of the alcohol was taken on a chemist's "Westfall Balance" to a precision of 0.1 per cent. The effect of surface tension is to cause the level in *T* to be slightly higher than the level in *R* when the two ends of the manometer are under the same pressure. This is not an error in the instrument, since the zero setting takes account of it.

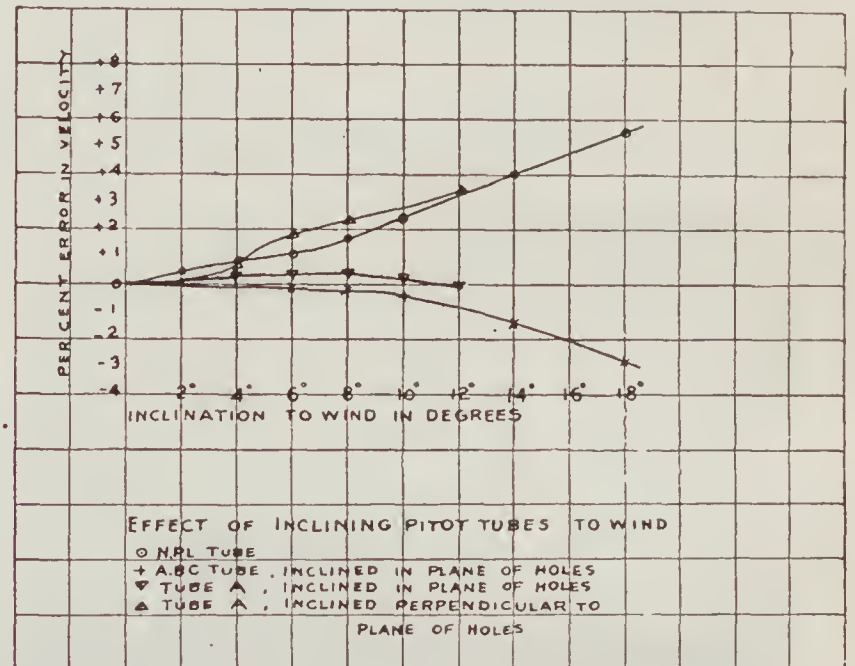


FIG. 7.—Effect of Inclining Pitot Tubes to Wind

Tests were made by connecting both the reservoir end of the alcohol gauge and one leg of the Chattock gauge to the same static pressure made by a water column. In this way errors due to fluctuations of pressure were eliminated. The Chattock gauge readings were taken as a standard for reference. The same Chattock gauge was used in all tests. The alcohol gauge was fitted with a straight glass tube, 0.15 inch in diameter. The tube was clean and dry. The velocity calculated from the alcohol gauge was found to be 12 per cent. low. The tube was then wet by blowing the liquid to the top of the scale and then allowing it to set back to zero. Readings taken subsequently were only

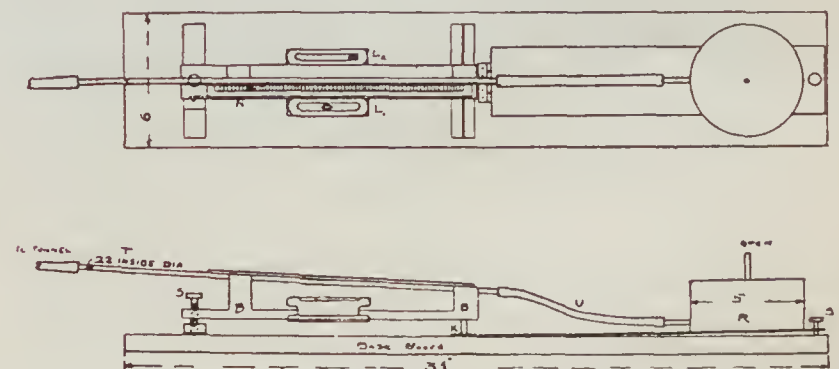


FIG. 8.—Alcohol Manometer

4 per cent. low. The experiment was repeated using a glass tube 0.17 inch in diameter, clean and wet. The velocity recorded was 4 per cent. low. A different tube, but of same diameter, was then put in the alcohol gauge. Its average readings were found to be 10 per cent. low. Examination of the glass tube showed two minute cracks in the glass hardly to be seen with the naked eye. A glass tube 0.2 inch in diameter was then tested and read 2 per cent. low. A tube 0.22 inch in diameter read 1.5 per cent.

low. A tube 0.25 inch in diameter could not be used on the 3-degree pitch, as the alcohol would not form a meniscus.

In all, some 1,000 check observations were made, and the following conclusions drawn:

1. The inclined type of liquid gauge as commonly employed in ventilation work is not an instrument of precision.
2. For consistent results the glass tubing used must be free from all slight flaws on the inner surface, which might cause changes in capillarity throughout the bore.
3. The tube must be uniform in diameter.
4. The tube must be as large as it is possible to use and still get a good meniscus.
5. For alcohol at 3 degrees inclination an internal diameter of 0.22 inch is suitable.
6. The maximum precision with such a gauge used to

(To be continued)

PROGRESS OF AMERICAN AVIATION

By ERNEST L. JONES, American Editor

THE YALE AERO CORPS

GREAT interest has been taken the past week not only by those connected with the nation's programme of preparedness, but by Yale men throughout the country in the training that the members of the Aero Corps of the Yale Battalion have been having on the *DN-1*, the first dirigible ever built in this country.

The Yale Aero Corps is at present composed of twenty members of the Yale Battalion, under Senior Lieutenant Paul F. Slocum. In addition, twenty other Yale men have been working with the Aero Corps, and will be enrolled with the Battalion as soon as arrangements can be made

measure air speeds from 4 to 40 miles per hour is about 1.5 per cent. on velocity.

7. The alcohol gauge properly constructed is consistent and very sensitive.

8. The alcohol gauge may be used as an instrument of precision when calibrated against a standard.

In its final form with 0.22-inch tube this alcohol gauge was found to measure speeds within 1.5 per cent. Such precision is ample for engineering work, and this type of gauge is recommended for a cheap portable instrument. For a laboratory standard, however, an error of 1.5 per cent. cannot be accepted. Since the gauge responded to changes of velocity of less than $\frac{1}{4}$ per cent. its sensitivity is such that it may be calibrated against a better manometer, and when calibrated may be as precise as the standard.

Although this was the first experience that a number of the Yale airmen had had with a dirigible, several members of the Corps have done a good deal of flying in this country and Europe. Cord Meyer, of Great Neck, L.I., one of the leading members of the flying squad, is a holder of a French pilot licence, while Gordon Tevis, of San Mateo, California, has done a good deal of flying on the Pacific Coast.

The first crew of the *DN-1* is composed of three Annapolis men: J. F. W. Gray, of Philadelphia; F. O. Rogers, of Texas; and R. J. Van Buskirk, of Florida. They have been working on the Navy dirigible ever since the Connecticut Company started its assembling in Hartford two weeks



THE YALE AERO CORPS

to enlarge the Yale military organisation. The Yale Battalion already has 483 members. The entire forty aero men have been under instruction on the *DN-1*, and have made a half-dozen trips to the State Armoury for this purpose.

Under Pilot E. J. Widmer, of the Connecticut Aircraft Company, the Yale men have been instructed in general manoeuvring, the posts and duties of engineer, observers and crew, and also the duties of the ground section, such as taking the machine in and out of the hangar and its care when on the ground. The Yale men have also been studying various features of the construction and designing of dirigibles under Pilot Widmer, who not only has had wide experience in Germany as a pilot on one of the largest of the fleet of Zeppelins of that country, but is conversant with every phase of construction and designing.

ago. They will accompany the *DN-1* to Pensacola, where the initial flight is to be taken.

UNCLE SAM'S BABY AIRSHIP

THE completion during the second week in March of the airship *DN-1*, which has been assembled for the inspection of Naval officers at the State Armoury in Hartford, Connecticut, marks an important step of the United States in its programme of preparedness. This is the first lighter-than-air machine to be owned by the United States Navy, and is to be used as a training ship for the instruction of pilots. Photographs of the airship have already appeared in AERONAUTICS.*

*We regret that we erroneously reported in our issue of April 26 that the airship broke from its moorings. The craft which went on this solitary joy-ride appears to have been a captive balloon.—ED.

The envelope, which was manufactured at Nangatuck, is 175 feet long, 35 feet in diameter, and has a capacity of 114,800 cubic feet. The gondola, which is capable of carrying a crew of eight men, is 20 feet long and 5 feet wide, and is so built as to float on the water.

The greatest care possible has been taken and no expense has been spared to make this balloon safe. The wreck of the Vaniman airship, at Atlantic City, with the loss of five lives and the cost of some \$75,000 to \$100,000 to the Goodyear interest, who built the balloon, is still remembered. Every portion of the fabric of the envelope has been examined with the aid of a strong light, and wherever the warp or woof threads appeared to be separated or thinner than usual, as they are in almost all goods, these parts have been reinforced, so that there would be no question as to the strength of the fabric. The consequence is that there is a large margin of safety in the strength of the envelope.

The State Armoury at Hartford, which was the only place large enough in Connecticut to permit the assembling of this airship, was daily visited by hundreds of people interested in the nation's programme of preparedness, and especially concerned with this first step towards the equipment of the United States Navy with dirigibles, such as it is proposed to do.

Through the courtesy of General George M. Cole, the Connecticut Aircraft Company, which built the *DN-1* for

with aeronautics in Europe can realise what strides the nations have taken there in the manufacture of and equipping of aircraft. It is estimated by those, and others conversant with affairs, that upwards of \$200,000,000 has been spent at present in aircraft building by the nations of Europe.

While the first dirigible built by the Connecticut Aircraft Company is a small, non-rigid affair compared to the Zeppelins in use on the other side, this company is already working out plans for the construction at once of a larger ship of the rigid type and built on the lines of the latest models.

AMERICAN INSTITUTE OF AERONAUTICAL ENGINEERS

THE American Institute of Aeronautical Engineers is in process of formation, with Howard E. Coffin, America's best-known automobile designer, and Elmer A. Sperry as the moving spirit. The tentative directorate consists of: Bion J. Arnold, Dr. A. F. Zahm, Elmer A. Sperry, Howard E. Coffin, H. C. Sadler, of Michigan University, Alex. McAdie, of Harvard, W. J. Hammer, C. Wesley Howell, jun., Leon Goldmerstein, T. R. MacMechen, Lieut. Jerome C. Hunsaker, Grover C. Loening, Glenn H. Curtiss, and M. B. Sellers. The



HANGARS AND MACHINES AT THE CURTISS TRAINING SCHOOL, NEWPORT NEWS

the Navy, was given the use of the State Armoury, and the greatest amount of courtesy has been extended by those connected with the Armoury to the manufacturers of the machine, as well as to the Yale and Annapolis men who are training on this airship.

It is expected that Captain Mark L. Bristol, head of the Navy Aeronautical Service, will inspect the aircraft at Pensacola, Florida, where the Government hangar is, and from which place the first ascent will be made. Captain Bristol, realising the imperative need of this Government for aircraft, recommended to Congress the past month an appropriation of \$13,600,000 for aircraft alone. He has studied the imperative need of the United States, and has declared that the fleet immediately needed by the Navy Department to provide for anything approaching adequate service calls for 128 aircraft, including five dirigibles. This does not include the 150 additional aircraft that Captain Bristol claims should be operated from fifteen naval shore stations under the patrol service. In this service he claims fifteen dirigibles are needed.

The European experts who have been working on the *DN-1* to construct this first dirigible are authority for the statement that only those who have been in close touch

officers have not been chosen, and the organisation is in an embryonic stage as yet. The institute is designed to do for aeronautics what the Society of Automobile Engineers has done for standardisation in the American automobile world. The project was launched at a meeting held some time ago, at which were present representatives of the following aeroplane and motor companies: Glenn L. Martin, Thomas, Gallaudet, Wright, Sloane, Curtiss, Aeromarine, Sturtevant, Sperry, Packard, and Huntington. The meeting was also attended by Coker F. Clarkson, manager of the Society of Automobile Engineers, and by Howard E. Coffin.

BOOK RECEIVED

"FIRST ANNUAL REPORT OF THE NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS, 1915." Washington: Government Printing Office, 1916. 303 pp., figs. and plates.

U.S. EXPORTS OF AIRCRAFT

	Aero- planes	Dollars	Parts Dollars	Total Dollars
January, 1916	—	—	550,375	550,375
Same period, 1915	5	71,315	21,878	93,193
Seven months ending Jan- uary, 1916	263	2,107,675	2,547,192	4,654,867
Same period, 1915	23	176,915	143,630	320,545

RANDOM REMARKS

XLVII.—PLEASING PRESENTMENTS By ARTHUR LAWRENCE

THE other day I was asked for a photograph. It was not to be of some fashionable beauty, blessed with that recondite charm which one associates with the revue girl in war-time. Not at all. By no means. It was to be of myself. Now the fact is that my features never have been strictly beautiful, and they



do not strike me as improving with age. I am reminded of a doctor who, after examining me some years ago, congratulated me on my youthful heart and my healthy pink skin. Then he upper-cut me with the remark: "The only thing that's against you is your face." Consequently I felt sure that the next doctor I had to see

—to whom my friend was an interesting preliminary—and who represented a greedy insurance company, would not be disarmed by my vagrant smile, but, without asking me to unbutton my waistcoat, or "say ninety-nine," would tell me to run away and try to be good. How can I tell a sweet girl that I can give her a doctor's certificate of a young heart or convince her that my pink-pearl appearance begins at my collar-band? Yet methinks I could find a word or two for my facial complexion. It minds me sometimes of the paper they use for Japanese prints, and at others of those bits of old parchment on which other folk's relatives bequeath and bestow.

Being desirous of obeying this flattering request, I bethought myself of the few occasions when I have not shunned the photographer. In the last professional effort I resemble the dying duck in a thunderstorm. There is a poetic look in the eyes which suggests to me that I must have been wondering how I was to meet my financial engagements. It was included, I believe, in an album sent to the King, and I hope that I am writing nothing improper when I confess that I like to think of Their Majesties turning over that album and imaginatively affixing laurel leaves to my brow. I have not yet been invited to Court, and the question remains whether it would be a good notion to ask for that photograph back. It might be more highly thought of elsewhere.

The last presentment was taken by an amateur wielding a big thing in cameras. I have come out with a fatherly smile which ought to pass that photograph into the most exclusive society. I have asked him to make a few much reduced copies, but, having foolishly paid for them in advance, I fear that they will never materialise. I have just been asked by a distinguished photographer to "sit" as a celebrity, but I rather think not. I have been there before. I would rather pay less. I have been photo'd at Hen-

don, but not alongside an aeroplane. I have never been cambered up to the point of sailing under false colours. I don't aviate worth a cent. Yet two camaresque gentlemen associated with the aerodrome insisted on doing their best. Vaingloriously I asked for copies, but, alas! one of them had broken the plate and the other his camera. I was photographed at the same time by the manager of a paper which shall be nameless. Plate and camera withstood the ordeal, but he had wobbled so deeply that nothing appeared on the print but my feet. He seemed disappointed. I was not. I doubt but those feet are the most expressive part of my personality. I rejoiced that my face was cut off, for the fellow is skilled in retouching and might have toned me up to resemble his own peerless beauty. I like to think that when Nature made him she broke the mould. So far as his face is concerned, I am charitable. Let bygones be bygones. Yes.

I notice that the youthful aviator comes out very well. But then, after all, he is young. I only hope that when he is old and deputed to wipe down a hangar that he will not depart very much from it. I remain clean shaven myself, so that I may hiss my sarcasms with greater effect, but one of these days I shall let all grow that will, and I shall wander around that aerodrome with my paternal whiskers floating in Heaven's bright breeze. Perhaps by that time I shall pretend I was a bit of a dog at the aeroplane business in my own day, and the new aviators will not know enough to contradict me. Yet I doubt if I shall have the courage to autograph presumed presentments of me.

Perhaps I will get hold of some servile dabbler in colours who will make me look really noble (in colour), and then I can have mezzoprints struck off of the blamed thing. I may make a profit on selling them, and, at the current rates for such bright words as these, I have no doubt I shall be glad of the money.



RUSSIAN AVIATOR DISCOVERS OUTPOST

An Exchange Telegraph Company's correspondent, describing the fighting near Trebizond and Erzerum, states:—At one point a Russian outpost was surrounded by some reinforcements from Kara Hissar, who came up unexpectedly. The Russians were 70 men against 300, but they held out valiantly in improvised earthworks and decimated the Turkish attackers. The outpost's plight was first discovered by a Russian aviator. On the way back to report this aviator came on a patrol of 100 Cossacks and dropped a note with the facts, and went east to ask for a relief force. When the relief force arrived it found the Cossacks fraternizing with the remnants of the formerly besieged outpost.

ENGINEERS AND THE AIR SERVICES

To the Editor of AERONAUTICS

April 20

SIR,—The present agitation for a better Air Service misses one of the most vital points of possible improvement.

Most of the talk centres around the co-operation of naval and military administration, which is inevitably difficult, if not impossible, to arrange on the lines suggested.

The Air Services, as fighting units, are at present essentially adjuncts of the Navy and the Army, and must so remain to the end of the present war at least.

In the future, possibly, the Air Service may become an independent unit, but we are concerned most just now with the immediate improvement of things as they exist.

What is, however, essentially common to both branches of the Air Service is their engineering aspect, and it is in this direction that co-ordination of effort can most usefully be tried, and might more profitably be insisted upon.

It has frequently and truthfully been stated that this war is an engineers' war, and it is all the more remarkable, therefore, that so little endeavour has been made systematically to organise the engineering personnel.

At the present time we are still without a Corps of Mechanical Engineers.

The Royal Engineers is a corps mainly concerned with engineering in the field, while the engineering branch of the Navy is mainly concerned with work on board ship.

We have no properly constituted branch of either Service concerned with engineering in the factory.

Until the formation of the Ministry of Munitions, there was not even a department of the Government for co-ordinating contracts and accelerating output.

The Ministry of Munitions is essentially a civil department of the State, as at present constituted. An engineer cannot enlist into the Ministry of Munitions.

If there were a Corps of Mechanical Engineers into which every qualified engineer and mechanic could now enlist, it would afford the means of more rapidly developing the various organisations that need such men at the present time.

Incidentally it would, I think, greatly facilitate both branches of the Air Service in the production and inspection of the high-class engineering work they require.

The inadequacy under which the Air Services labour is not one of administration, but of material.

The administrative requirements are fundamentally different for the two branches of the Service, but the nature of the material is fundamentally the same, and I firmly believe that much might be done to accelerate production by co-ordinating the engineering aspects of the situation.

The proposal that I make for the formation of a Corps of Mechanical Engineers goes far beyond the immediate question of the Air Services, inasmuch as such a Corps would form the nucleus of a general co-ordination of engineering effort on the technical side.

Primarily, the function of the directorate of the Corps would be to classify the country's available engineering personnel. It would keep track of the whereabouts of every qualified engineer and mechanic, and would supply drafts of such men wherever their services might most urgently be required.

For example, suppose the Aeronautical Inspection Department of the War Office required more examiners and inspectors; men from the Corps of Mechanical Engineers would be attached to the Inspection Department for that special duty.

Similarly, if the Royal Flying Corps or Mechanical Transport, for example, required engineers to undertake the maintenance of material in the field, they would obtain them from the Corps of Mechanical Engineers, and if at a later period they could be released from service, they would revert back to the Corps of Mechanical Engineers with that much additional experience to their credit.

While the duty of the directorate of the Corps of Mechanical Engineers would be mainly to assist existing organisations to work efficiently, it would also endeavour as far as possible to arrange for uniformity of method, where such uniformity would facilitate progress.

For example, there is nothing that so influences production as the question of detail inspection, and there is a marked difference in this work as at present carried out under the War Office and the Admiralty administrations.

It would be the duty of the Corps of Mechanical Engineers to unify the technical procedure, so that a manufacturer building a certain engine, for example, for both the Admiralty and the War Office, would not build it under entirely different conditions, as is in fact the case to-day.

In doing this, an endeavour might also be made to broaden the basis of inspection by regulating it more closely by the evidence of actual performance.

One of the chief criticisms levelled against detail inspection is that it makes insufficient allowance for practical requirements.

This defect would be cured if instructions to Inspectors of Workmanship were prepared by Inspectors of Performance specifically told off to observe the actual behaviour of machines in service.

Inspectors of Performance would spend their time partly with the Army in the field and partly in the works, and each piece of mechanism would be under the special observation of a group of men who would work in co-operation and would become experts in their particular subject.

They would keep the engineers in the factory advised of the difficulties experienced in the field, and at the same time would keep the engineers in the field advised of the special defects experienced at home.

In this way there would be established a link between the man at the front and the man at home such as does not at present exist, but which would, I feel sure, exercise a material benefit on all concerned.

There would be no difficulty on the score of militarising engineering labour, because the works organisations could continue as at present, on a civil basis, by transferring all men so engaged to the reserve. This is, in fact, the condition of those engineers who have attested, but who are still engaged in civil employment.

The essential point gained by the creation of the Corps of Mechanical Engineers would be that all qualified men now being released by engineering factories would pass straight into the Corps of Mechanical Engineers and would be drafted thence wherever their services were most required—if necessary into Infantry and Artillery regiments. The point is that the Corps of Mechanical Engineers would always know their whereabouts, and would have the authority to get them back again if their particular skill was more urgently required elsewhere.

Similarly, in the case of all the engineers now in the Army outside those in the Royal Engineers, arrangements would be made to obtain their names in case their service might be required, but obviously no dislocation of existing conditions would be permitted unless the urgency of the case warranted it.

At the present time no organisation dealing with the country's engineering personnel exists, and since the beginning of the war our strength in this direction has been frittered away by the release of men from factories direct into the Army, without any attempt to keep track of them.

The Ministry of Munitions has, of course, taken the question of the supply of engineering labour in hand to some extent, but the Ministry of Munitions does not deal with all the grades that would properly belong to the Corps of Mechanical Engineers, nor does it retain the same permanent hold over the individual. The Ministry of Munitions either retains the man in civil employment or releases him. If he is released, his identity as a potential unit of

our engineering strength becomes speedily submerged, whereas if he belonged to the Corps of Mechanical Engineers he would be retained permanently and the Army would not suffer, because the Corps of Mechanical Engineers would be responsible for supplying the Army as well as for supplying the factories under civil control.

All branches of engineering other than those already undertaken by the Royal Engineers and the engineering branch of the Navy would come under the Corps of Mechanical Engineers.

It is apparent that the Corps of Mechanical Engineers would be of military status, but since it would be concerned equally with the Army and the Navy, it could not properly be placed under the administration of either the War Office or the Admiralty. The obvious procedure would be to place it under the direction of the Ministry of Munitions, which would then control all aspects of this side of war and would provide the much-needed connecting link between the two fighting services.

In addition to the above-described work, the Directorate of the Corps of Mechanical Engineers would also be responsible for the collection of technical data, standardisation, and the co-ordination of progressive design.

The whole of the undertaking sounds monstrously large, no doubt, but it must be remembered that much useful work has already been done, and many organisations and engineering institutions already exist whose co-operation would render the accomplishment of the broader scheme eminently practicable.

The Ministry of Munitions and the Directorate of the Corps of Mechanical Engineers would constitute a central technical authority of national importance to which all the older institutions would not hesitate to render assistance at the present time. And, so long as the policy is to unite and co-ordinate the best of what already exists, the issue is assured of success.

A. E. BERRIMAN, Chief Engineer

The Daimler Company, Ltd., Coventry

MODEL AEROPLANES—XXXII

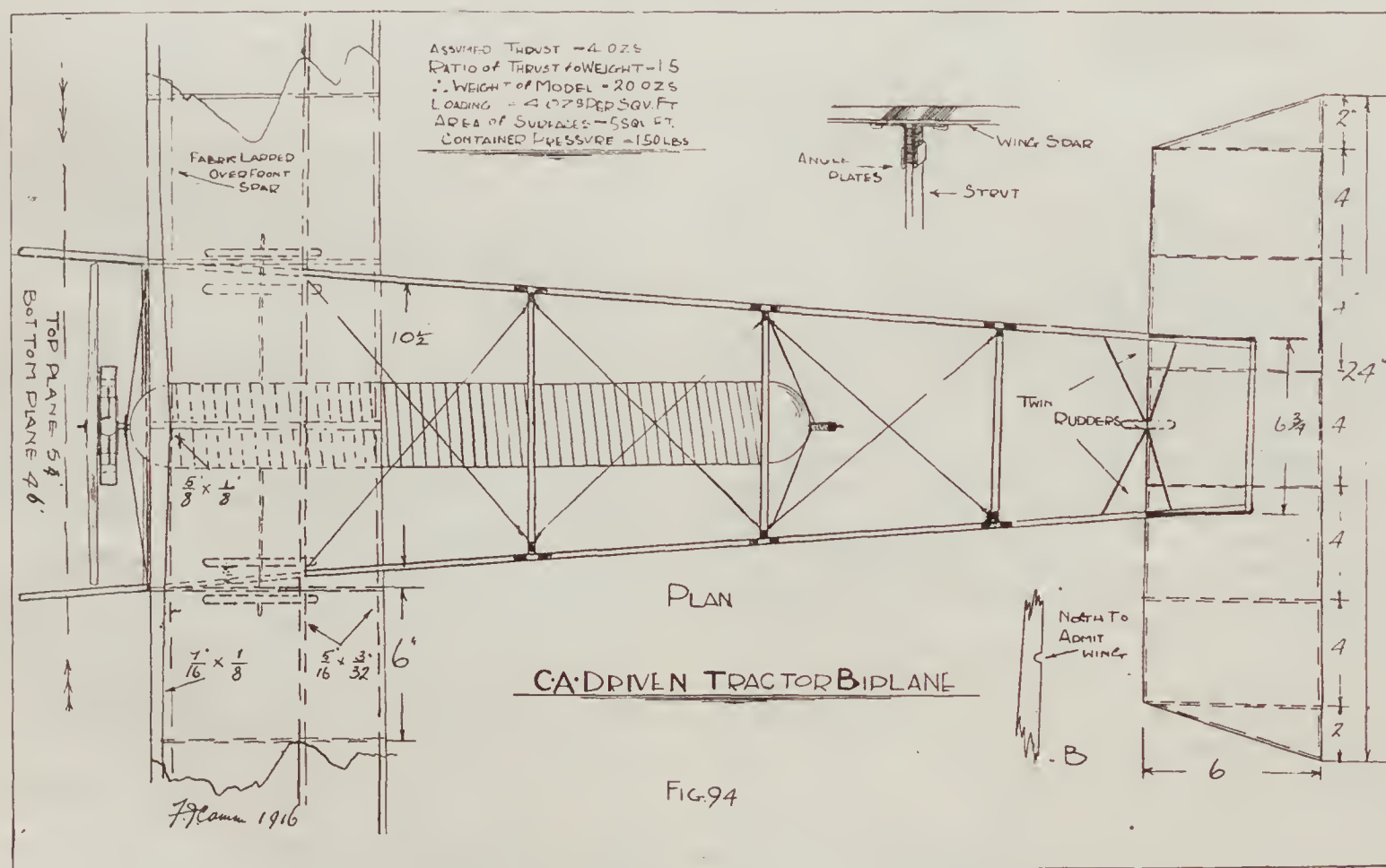
By F. J. CAMM

THE part plan view of the model will make the relative position of the various component parts quite plain. The two top tail outriggers pass through the fabric at the point where the spar is located, their front ends being pinned and cross bound to the wing spar, which is made of greater cross section in the centre, so that its strength is not materially impaired through the piercing of it. Birch is to be used for the wing spars and ribs of the sections indicated.

clenched over by supporting the wing upon an iron weight and tapping them back flush to the spars.

The full-size section of the camber should be drawn upon a board, with which to check the accuracy of the first rib to be cambered (the end rib).

The ribs are cambered in a jet of steam, the convex or top sides being placed nearest to it. Having cambered the end rib carefully to vie with the drawing, the others may be



The planes are ribbed at periods of six inches and given a camber of three-quarters of an inch, the greatest depth of which is two and a quarter inches from the leading edge. It is far easier to impart the camber after the wing framework is made than to camber each rib separately. Each rib should be cut an inch longer than necessary and pinned and glued to the spars, with half an inch overlapping each of these latter. When the glue is quite set, the pins may be

matched to it. It will thus be easy to ensure that every rib is of the correct curvature, as any mistake in the steaming of the rib will distort the wing spar at the point of its attachment.

If, however, it is thought advisable to camber the ribs first, a wooden bending jig should be made, to enable several ribs to be bent at one operation. The ribs should be tied down to the jig with string, and thus held under the steam jet,

being well dried before the fire before they are detached from the jig. All three spars pass *underneath* the ribs.

A very light fabric should be chosen, such as can be obtained from either of the model aero accessory warehouses, or an unproofed Japanese silk can be used and varnished when on the wing. If this latter is used, it will be found advantageous to use a yellow hue, as this colour is least affected by the action of the varnish. But the covering of the wings must be left for the time being, for the reason that the sockets to which the inter-struts are made fast must first be attached. Further, the top plane must be covered after the tail outriggers have been assembled, as it is so much easier to make the joint between the wing spars and these latter before the fabric is attached.

To render it unnecessary to refer to the point further, it may be noted that the fabric is brought over the leading spar of each wing to pocket the spar. It is much neater to sew the fabric along on the leading edge, as when glue is used an unsightly black smear shows through. The fabric should be stretched from end to end first, the fabric overlaps being glued on the bottom face of each end rib. Drawing pins should be partially pressed into the ribs to secure the fabric until the glue is set.

I show at *B* the method of securing the bottom plane to the inter-struts; as illustrated, convenient notches are cut in the struts into which the plane is sprung. It will have been noticed from the side elevation given in the previous contribution that the width of the inter-struts increased towards the bottom or lower ends and also that they inclined slightly; this is to provide for the entry of the lower plane, since the

top plane is attached *outside* the struts, while the bottom is placed *inside* them.

The tail is built up from split bamboo, an eighth by three thirty-seconds of an inch in cross section, and the rudders are framed up from twenty-gauge piano wire. The ends of the rudder frames are forced through the longerons, and the ends bent back in alignment with them; they are then bound to the longeron with black three-cord carpet thread. The rudders are covered after being fixed to the outriggers. When it is necessary to adjust them the piano wire will be found sufficiently ductile to admit of a warp being placed thereon. In the event of it being essential to adjust the tail, I have shown (in the side elevation given previously) a quadrant into which the leading edge of the tail fits—but this detail will be illustrated subsequently with the constructional details.

(To be continued)

REPLIES TO CORRESPONDENTS

L. C. (Clapton)—Your proposed engine would be quite successful made on the lines you suggest. One very successful plant, the Desoutter, has its exhaust arranged through ports similar to those shown in the sketch accompanying your letter. We would suggest, however, that in place of the four holes, of rather large diameter, shown in your sketch, a series of one-eighth inch holes be drilled round the cylinder in such a position that the exhaust takes place three thirty-seconds of an inch before the piston has reached the bottom of its stroke.

AIRCRAFT IN ACTION

OFFICIAL INFORMATION

ENGLAND

May 1—German Machine Driven Down—Yesterday (April 30) there were seven combats in the air, in the course of which one hostile machine was driven down in the German lines, and a second, while being pursued, got out of control and fell on the roofs of Bapaume.

May 2—Two Enemy Aeroplanes Driven Down—As a result of combats in the air yesterday (May 1) two hostile aeroplanes were driven down in a damaged condition and were seen to land a short distance behind the German line.

May 3—Zeppelin Raid on Scotland—Issued by the Field-Marshal Commanding-in-Chief Home Forces: Five hostile airships attacked the north-east coast of England and south-east coast of Scotland last night (May 2). The movements of the raiders appear uncertain. A few bombs were dropped in Yorkshire, but no details are yet to hand as to casualties and damage caused thereby.

Later.—The Zeppelin raid of last night (May 2) covered a considerable extent of our eastern coasts. At least five or six airships actually crossed the shore, but reports received from reliable observers made at various times during the night at many points—some so far distant as Rattray Head in Scotland down to the north coast of Norfolk—would point to a possibility of a greater number of airships having been employed off our coasts. The enemy, however, made only two attempts to penetrate inland. About 100 bombs were dropped, scattered over many localities. Their exact number is difficult to give, since a great number fell in uninhabited areas and some others into the sea. Only in a single locality did the raiders cause any casualties or effect much damage. In this case the bombs which fell amounted to 12 explosive and four incendiary, with the result that 18 houses were damaged. The casualties totalled: Six men (including one soldier) and three women killed; 19 men (including three soldiers) and 8 women injured. Total, 36 casualties. The remaining 70 odd bombs occasioned only two casualties (one soldier and one child slightly injured). The damage affected one storehouse and a few cottages, mostly broken glass. The raiders only twice came within the range of any anti-aircraft artillery, and on both occasions retreated out of range without delay.

(See German official)

May 3—Raid on Deal—A hostile aeroplane visited Deal at 3.59 this afternoon (May 3), coming from the direction of Ramsgate, and dropped six bombs on the railway station. Several houses were badly damaged. One man was badly injured. This is at present the only casualty known. The aeroplane made off, flying above the clouds. Our aircraft went up in pursuit.

Later.—Further reports of to-day's seaplane attack on Deal give the casualties as two men and one woman injured. There have been no deaths. The windows of a church were broken, the roof of a house blown off, and a public-house seriously damaged. Windows were broken in about 20 houses. Seven bombs in all were thrown.

(See German official)

May 3—Aircraft Active—Yesterday (May 2) our aircraft carried out a considerable amount of work in spite of the thundery weather. Few hostile aircraft were seen.

May 5—Two Enemy Machines Driven Down—Yesterday (May 4), as a result of combats in the air, we drove down two enemy machines behind the German lines. One machine was wrecked, and the pilot of our aeroplane fired upon the occupants after landing, and then returned safely to our lines. The other enemy machine was damaged. During the day one of our aeroplanes was lost, being brought down in the enemy's lines.

May 5—Two Zeppelins Destroyed—Admiralty reports: 12.30 p.m.—A Zeppelin was destroyed yesterday (May 4) by one of our light cruiser squadrons off the Schleswig coast.

6.45 p.m.—The Commander-in-Chief Grand Fleet has reported that the ships which destroyed the Zeppelin yesterday (May 4) were H.M.S. Galatea, Commodore E. S. Alexander-Sinclair, M.V.O., A.D.C., and H.M.S. Phaeton, Captain J. E. Cameron, R.N., M.V.O. The Zeppelin was apparently employed on scouting duty when she was destroyed by the gunfire of these two vessels.

7.15 p.m.—Vice-Admiral De Robeck reports that at about 2.30 this morning (May 5) a Zeppelin approached Salonika. When passing over the harbour she was heavily fired on and hit by the Fleet, and came down in a blaze near the mouth of the Vardar River. There were no survivors.

(See French official)

May 5—Zeppelin Destroyed—Admiralty statement: A Zeppelin was destroyed yesterday (May 4) by one of our light cruiser squadrons off the Schleswig coast.

May 6—The Destruction of L7—Admiralty report: A more detailed report has now been received of the destruction of Zeppelin L7. It now appears that, though severely damaged by H.M. ships Galatea and Phaeton, her destruction was completed by a British submarine, commanded by Lieut.-Commander F. Feilman, R.N., which rescued seven of the Zeppelin's crew, and has returned with them. She was attacked and slightly injured by a German cruiser on her return journey.

May 6—The Salonika Capture—Admiralty report: In a further message from Vice-Admiral De Robeck concerning the Zeppelin brought down at Salonika, it is now stated that survivors of the crew have been found, and four officers and eight men have been made prisoners.

(See German official)

May 6—Hostile Machines Driven Off—From General Headquarters: Yesterday (May 5) a considerable amount of successful air work was carried out. The few hostile machines seen were driven off.

May 7—British Machines Missing—Admiralty report: With reference to the official German report published to-day (May 7), it is the fact that two of our naval aeroplanes are missing. The body of Flight Sub-Lieutenant H. R. Simms, R.N., has been picked up at sea, and the observer, Sub-Lieutenant C. J. Mullens, R.N.V.R., is missing, his lifebelt having been picked up in the same vicinity. As regards the

aeroplane reported captured by the Germans, the names of the officers concerned in this case are:—Flight Sub-Lieutenant Arthur T. N. Cowley, R.N., and Sub-Lieutenant Ronald M. Inge, R.N.V.R.

FRANCE

May 1—April Aerial Losses—During the month of April our fighting aircraft, which was very active, particularly in the region of Verdun, obtained important results in numerous aerial combats, in which they undoubtedly had the advantage. Our pilots succeeded in bringing down 31 enemy aircraft. Nine of these fell in our lines, and 22 were seen by our observers falling in flames or completely smashed up in the German lines. During the same period six French aeroplanes were worsted in fights and fell in the enemy lines.

[See the list of casualties in this issue.—ED.]

May 1—Air Raids on Railways—On the night of April 29-30 our attacking squadrons dropped a number of projectiles on the revictualing and munitions depot of Sébastopol, south of Thiaucourt, on the Etain railway line, on bivouacs near Spincourt, and on the railway stations of Apremont, Grandpré, Challerange, and Vouzières. A number of explosions are reported to have occurred on the railway lines, and several fires broke out in the course of these operations.

May 2—Enemy Machine Brought Down—Yesterday (May 1) a German aeroplane was brought down by one of our pilots in the course of a lively fight. The machine fell in the enemy lines to the north of Douaumont.

May 4—Enemy Machine Wrecked—One of our machines fought two German machines in the region of Douaumont. One of the latter fell in a wrecked condition, and the other fled.

May 5—Zeppelin Destroyed at Salonika—During the night of May 4-5, about 2 in the morning, a Zeppelin which was flying over Salonika was brought down by the guns of the Allied Fleets. The Zeppelin fell in flames at the mouth of the Vardar.

May 7—Captive Balloons Adrift—In the course of the gale which raged the day before yesterday (May 5) about a score of our captive balloons broke from their moorings. Several were carried in the German lines, while others came down within the French lines. The majority of the observers succeeded in landing in our lines by using their parachutes. News, however, is lacking of some who were carried into the enemy zone.

RUSSIA

May 3—Albatros Forced to Descend—In the region north-west of Yarmolintze, south of Proskouroff, an enemy Albatros was compelled to descend owing to motor trouble, and we captured the aviators.

May 4—Captive Balloon Brought Up—South of the region of Dyvinsk enemy aeroplanes dropped bombs on numerous points of this front. In the district south of the town of Krevo there was a violent artillery duel, in the course of which one of our shells blew up a German captive balloon which was correcting the German fire.

May 6—Enemy Aircraft Active—Enemy aeroplanes dropped bombs on several parts of the front.

MESOPOTAMIA

May 6—Two Machines Brought Down—Turkish official—On the day of the capitulation of Kut-el-Amara one of our aeroplanes, piloted by Captain Schütz, succeeded in shooting down in an air fight an enemy aeroplane, which was captured by us. The pilot was found dead, but the observer was captured. On the same day Captain Schütz brought down a second machine, the occupants of which fell into our hands wounded.

ITALY

May 1—Airship Bombards Railway—Last night (April 30) one of our airships, despite heavy clouds and stormy weather, reached the Lagarina Valley, where it bombarded the railway from Calliano to Trento and the railway station at Trento. The permanent way and the station were damaged, and fire broke out. The airship returned safely, although it was subjected to heavy artillery fire, helped by searchlights.

May 3—Enemy Aviators Repulsed—Between the Adige and the Brenta an intense artillery duel took place. Enemy aeroplanes attempting to fly over the intervening mountainous region were repulsed by our aviators, who gave chase.

May 4—Italian Airship Lost—The greatest aerial activity prevailed in the whole theatre of operations. Enemy aeroplanes dropped bombs on the Upper Val Camonica, the Ansel Valley, the Lower Isonzo plain, and on the towns of Ravenna and Cervia. A few persons were wounded and very slight damage was done. Two of our airships last night (May 3) bombarded enemy entrenchments, batteries, and camps in the vicinity of Rubbia, Merna, and Biglia, in the Vipera (Wippach) Valley, and the well-known aerodrome of Aisovizza, to the east of Gorizia. About two tons of explosives were dropped on the objectives with visibly very effective results. On the return journey one of our airships fell, from reasons still unknown, in enemy territory in the vicinity of Gorizia. The other airship returned unharmed to our lines. (See Austrian official)

EGYPT

April 30—Successful Aerial Reconnaissance—War Office statement: The presence of British and Egyptian troops in Kharga (400 miles south of Alexandria, and about 100 miles west of the Nile) enables reconnaissances to be carried out in all directions, and the R.F.C. makes continual flights to Dakhla (farther west, in the Libyan Desert), inflicting considerable damage on each occasion with bombs and machine-guns. No movement of the enemy from this oasis can hope to escape undetected.

TURKEY

May 1—Old British Aeroplanes—The Turkish *communiqué* relating to the fall of Kut states: "The British tried all possible means to supply food to the beleaguered force. They first threw down sacks of flour from aeroplanes, but Turkish forces put an end to this, Turkish battle aeroplanes shooting down one after another of these old British machines."

May 7—Goods Train Hit at Smyrna—One of the bombs dropped on May 3 on Smyrna by two hostile aeroplanes hit a goods train. Three persons were slightly wounded. On the same day a hostile aeroplane flying over Bir-es-Sebah was brought down north of that town. The pilot was captured. He had promised some approaching Beduins money if they would facilitate his escape.

AUSTRIA

May 4—Italian Airship Brought Down—Italian theatre of war: Last night (May 3) an enemy airship crossed our lines at Wippach and dropped some bombs. It then proceeded in a northerly direction towards Linbach and Salloch. On its return our artillery fire cut it off near Dornburg, and the airship, which was simultaneously attacked by our aviators, was set on fire and fell a wreck near the drill-ground at Goerz. The four occupants were killed.

Another Austrian *communiqué*, issued by the Naval Staff, says: "At three o'clock this afternoon (May 4) a squadron of our seaplanes bombarded the railway station, a sulphur factory, and the barracks at Ravenna with good effect. Conflagrations were observed in the sulphur factory and at the railway station. Although heavily bombarded by two anti-aircraft batteries, all the aeroplanes returned. At the same time a reconnoitring torpedo-boat flotilla met four enemy destroyers to the south of the mouth of the River Po. A long-range artillery engagement ensued, but we were unable to score any success, as the superior speed of the enemy did not allow of our coming to close quarters. Several of our aeroplanes participated in the fighting, and attacked the enemy vessels with machine-guns."

(See Italian official)

May 5—Bombs on Limone—An enemy aeroplane dropped four bombs on Limone (Lake Garda) without doing any damage to life or property. Attempts by enemy aeroplanes to raid our territory were repulsed by gunfire and by the prompt intervention of our chasing air squadrons.

May 5—Raids on Brindisi and Valona—On Thursday morning (May 4) our seaplanes bombarded Valona and in the afternoon Brindisi. At Valona the batteries and the aerodrome were several times effectively hit. In Brindisi railway trains, the station warehouses, the arsenal and a group of destroyers lying close together were several times hit. Many bombs exploded in the town. An ascending hostile aeroplane was immediately chased. On the way back, far out to sea, the cruiser Marco Polo was observed with the crew standing about together on deck. The ship was fired at with machine guns. In spite of the heavy anti-aircraft fire, all our aeroplanes returned safely from Valona and Brindisi.

May 5—Raid on Russian Railway Junction—The day before yesterday (May 3) our aviators dropped bombs on the railway junction of Zdobunovo, south of Rovno. It is stated that the station, workshop shops, rolling stock and the railway lines were hit. Several buildings caught fire.

GERMANY

May 1—French Biplane Brought Down—Our aeroplanes squadrons abundantly bombarded enemy troop quarters west of Verdun and magazines to the south of the town. In an air fight a French biplane was shot down east of Novon. The occupants were dead.

May 2—Raid on Russian Air Bases—German Naval report: A naval airship on May 1 successfully attacked the military installations at Moon Sound and Pernoff. The airship landed unhurt. At the same time a squadron of our seaplanes dropped bombs on the military installations and aerodrome at Papenlin in the island of Oesel. The seaplanes returned undamaged, and good effect was observed. A hostile air squadron on May 1 attempted to attack our naval installations at Windau, but it was compelled by our anti-aircraft guns to return without having achieved anything.

(The Russian air bases attacked are situated in or about the archipelago at the northern approaches of the Gulf of Riga. Windau, attacked by the Russians, is 100 miles from Riga.)

May 2—Three Enemy Aeroplanes Shot Down—It has now been reported that two French aeroplanes were brought down in aerial battles on April 30—one over Channe Fort, west of Verdun, and one over Thierville Wood, south-west of the town. Yesterday (May 1) First Lieutenant Boelke shot down his 15th aeroplane over Heide Hill, and First Lieutenant Baron von Althaus his fifth enemy aeroplane north of Fort St. Michel.

May 3—Five French Machines Brought Down—First Lieutenant Baron von Althaus shot down his sixth enemy aeroplane over the Caillette Wood. A French aeroplane was brought down in an air fight south of the Thiaumont Redoubt. Two other machines were brought down by our anti-aircraft guns—one south of the Taler Krige and the other near the Thiaumont Farm. A fifth machine was brought down by our machine-gun fire near Lardumont. The pilot of this last machine was killed and the observer severely wounded.

May 4—Bombs on Ostend—One of several enemy aeroplanes which dropped bombs on Ostend this morning (May 4), but which only succeeded in hitting the gardens of the Royal Castle, was shot down after an aerial battle near Middelkerke. Its occupant, a French officer, was killed. (Another version says two French officers were in the machine and that they were both killed.) To the west of Liévin two enemy aeroplanes were brought down by the fire of our

anti-aircraft guns and machine-guns. In the neighbourhood of Vaux Fort two French biplanes were put out of action by our aviators.

May 4—Loss of L20—The Admiralty Staff announces that a naval airship squadron, during the night of May 2-3, attacked the central districts and northern portion of the English East Coast and dropped numerous bombs, with apparent good results, on factories, smelting furnaces, and railway premises near Middlesbrough and Stockton; industrial works near Sunderland; the fortified coast place of Hartlepool; the coast batteries south of the River Tees, and the British warships at the entrance to the Firth of Forth. In spite of a heavy bombardment, all the airships returned to their home ports with the exception of L20, which, owing to a strong southerly wind, was driven off to the north and came to grief near Stavanger. The airship was lost, but the entire crew were rescued. In the afternoon of May 3 one of our naval aeroplanes attacked an English coast battery near Sandwich, south of the mouth of the Thames, and the aerodrome west of Deal with success.

(See English official),

(The Press Bureau states that the exaggerations and misstatements in the above report are of the usual kind.)

May 4—Submarine Shoots Down Aeroplane—In the Baltic the activity of our naval aviators is vigorous. A squadron of seaplanes again bombarded the Russian battleship *Slava* and an enemy submarine in Moon Sound, scoring hits. An enemy air attack on our coast station of Pissen caused no military damage. One of our submarines, on April 30, shot down a British aeroplane off the coast of Flanders. The occupants were rescued by an enemy destroyer.

(The Press Bureau states that the exaggerations and misstatements in the above report are of the usual kind—Ed.)

May 4—Railway Bombarded—Our airships attacked the railway establishments on the Molodetchno-Minsk line and the railway junction at Luninets to the north-east of Pinsk. Good results were observed.

May 5—Air Losses for April—Aerial fighting developed in the course of April, especially in the second half of the month, to a great extent on the Western front, with increased bitterness. In place of single combats, fighting conducted in groups and squadrons is becoming more and more prominent. These battles are, for the greater part, fought to a finish on the other side of our lines. In the course of these battles on the Western front 26 enemy aeroplanes were brought down by our battle airmen during April, two of which came into our possession on our side of the front line of trenches. In addition to these, 10 aeroplanes succumbed to the fire of our anti-aircraft guns. Our own losses, on the other hand, amount altogether to 22 aeroplanes. Of these, 14 were lost through aerial battles, four through not returning, and four through being shot down from the earth.

May 5—English Biplane Captured—An English biplane, with a French distinguishing mark, fell into our hands, undamaged, on the coast, in the neighbourhood of the Dutch frontier. Its occupants saved themselves in neutral territory. A German squadron freely and successfully dropped bombs on the railway establishments in the Noblette and Aube Valley, in Champagne, as well as on the aerodrome at Suippe.

May 6—Airship Lost at Salonika—One of our airships did not return from a trip to Salonika. According to English reports it was shot down and destroyed by fire.

(See English and French official reports)

May 6—French Captive Balloons Adrift—To the south of Warneton Sergeant Frankl brought down a fourth English biplane, and has thereby put his fourth enemy aeroplane out of action. His Majesty the Emperor has given expression to his appreciation of the achievements of the capable aviator by promoting him to rank of an officer. To the south-east of Diedenhofen (Thionville) a French machine was forced to land and its occupants were taken prisoners. A great number of French captive balloons broke loose last night (May 5) owing to a sudden storm and floated over our lines. More than fifteen have been salvaged up to the present.

(See French official)

May 7—L7 Missing—The airship L7 has not returned from a reconnoitring flight. According to an official statement by the British Admiralty, the airship was destroyed on Thursday (May 4) in the North Sea by the British naval forces.

(See English official)

May 7—Two British Machines Brought Down—German Admiralty report: On Friday afternoon (May 5) a hostile aeroplane was brought down in the course of an air fight off the coast of Flanders, one of our torpedo-boats assisting. The approach of British forces prevented the rescue of the occupants. One of our torpedo-boats yesterday (May 6) captured a British aeroplane off the coast of Flanders undamaged, the occupants, both officers, being also captured.

(See Admiralty statement)

THE END OF L20

Once again one of the raiding Zeppelins has effected its own destruction, and so proves once more that the balance in the profit and loss account of these raids is certainly not on the side of the Huns. The L20, next in series to the L19, which met its

fate in the North Sea, took part in the raid on Scotland during the night of May 2-3, appears to have lost her bearings, blown across to Norway, and there crashed, possibly for lack of petrol, since she must have been up nearly twenty-four hours. The local reports of the matter appear to be as little reliable as usual. The more plausible are appended.

Stavanger, May 3—The Zeppelin L20 was observed at 10 o'clock this morning over the southern part of the Jæderen coast near here. The airship flew slowly towards the north and came nearer and nearer to the coast, which it eventually crossed. It then passed at a low altitude over the country as far as the Hafsfjord, where it came down on the water. The Zeppelin appears to have been damaged. It is reported that the crew jumped out of the cars near Hinna.

People on land saw five or six men jump out, and boats went to their assistance. It was subsequently announced that the commander and a seaman had been rescued and taken ashore on the eastern coast of the Gansford, where they were medically treated. The airship was afterwards driven over the hilltop. The afterbody broke before the after cabin and fell to earth. When the airship was driven against the hillside some of the crew jumped out or were hurled out. The airship then rose a little and was driven in a westerly direction, but broke in two and descended rapidly down on the Hafsfjord. A torpedo-boat, which followed the airship along the coast, went to its assistance and rescued three men who were still in the cabin. The fourth man had jumped out shortly before. Of the rescued men three officers and two non-commissioned officers have been brought to Malde. It is not known where the rest of the crew are, but parties have been sent out with orders to bring them to Malde. The airship was completely destroyed and was driven ashore on the western side of the Hafsfjord, near its outlet to the sea.

(Hafsfjord is on the west coast of Norway, about ten miles south of Stavanger.)

Zeppelin L20 is now lying on shore on the west side of Hafsfjord, watched by the military. Sixteen of the crew were captured. Three of them are injured, one having a broken leg and another a broken arm. It is thought that the cause of the accident was the lack of petrol.

Copenhagen, May 4—A message from Stavanger to the *Aften-bladet* reports that the German airships which raided Great Britain on Tuesday night left the station in Germany in fine weather. At midnight they spread over Great Britain on both sides of the English and Scotch border. Each Zeppelin was given her own field of activity. The L20 belonged to the northern party, and had rather a large area to cover. A south-easterly wind with heavy snow arose, the velocity of the wind reaching thirty-two to thirty-seven miles an hour. Early on Wednesday the L20 left her field of activity and, owing to the heavy south-easterly wind, a course was laid as north-easterly as possible. [This is an obvious mis-statement—Ed.] By nine o'clock yesterday morning it had become evident that the airship could not reach Germany, and her commander decided to try to land in Norway. All secret papers and the explosives still on board were dropped into the sea, as prescribed in his instructions. He then tried to land, with the result already reported.

Among the local correspondents the *Morning Post* man announced that the craft carried a crew of nineteen, which is probably correct, and at any rate bears an air of greater verisimilitude than other estimates of the number, which range up to thirty-seven.

Christiania, May 4—The wrecked Zeppelin belonged to the squadron of six ordered to visit the North of England on Tuesday night, districts being divided between them beforehand. The other Zeppelins had returned when the L20, at three o'clock in the morning, left the field of operations. Approaching the coast of Norway she was running short of fuel, and the captain, Lieutenant Stabbert, decided to descend in Norway.

When crossing the small Gansford, south of Stavanger, the ship was only 20 metres from the surface, and eight men jumped into the water, among them Lieutenant Stabbert. All were soon picked up and received medical aid, several being more or less injured. The lightened ship ascended and crossed the peninsula. The rest of the crew were obviously no longer able to control the ship, which was driving before the wind in the direction of Hafsfjord, where five more men jumped into the water. All were rescued by motor-boats. The airship was soon after smashed against the rocks. The remaining three of the crew succeeded in escaping death. A Norwegian Navy boat soon arrived and made the airship secure. All the crew were arrested and interned in the drilling field at Malde, near Stavanger. Fearing that the airship when broken up by the gale would occasion damage, the captain in command of the troops this afternoon ordered his men to fire on her. She exploded with a tremendous report, the concussion breaking all windows within a long distance.

One of the crew of L20 told a correspondent that during the attack on England the airship was sufficiently damaged by British projectiles to decide the commander to hurry his return home in order not to incur the risk of being shot down on British soil. He was not able to realise his intention, because the steering apparatus failed and the wind took the airship at a great speed in the direction of Norway.—*Morning Post*

STATEMENTS IN PARLIAMENT

HOUSE OF COMMONS

May 2—*Home Secretary and Mr. Billing*—Mr. Billing (Ind., Herts, E.) asked the Home Secretary why the correspondence between them had been published without his (Mr. Billing's) last letter.

Mr. H. Samuel replied that the remainder of the correspondence was published on April 28. The reason why the hon. member's letter of April 24 was not published with the first instalment was that although it was sent by hand it was not delivered until the evening of the 26th, after the earlier correspondence had already been sent to the Press.

Mr. Billing: Does the unwritten law regarding the publication of letters apply to correspondence with the Cabinet?

Mr. Samuel: Yes, sir. I wrote the hon. member on Saturday morning, saying that with his assent I proposed to publish the correspondence. I had no reply until Wednesday, and I assumed, not unnaturally, that he assented. (Cheers.) I must answer the insinuation that I received the hon. member's letter before I sent the correspondence to the Press. That was not so.

Mr. Billing: But before the correspondence was published.

Mr. Billing asked the Under-Secretary for War whether, as a result of recent criticism in the House on the inefficiency of the Royal Aircraft Factory aeroplane BE-2c when opposed to enemy aircraft, orders had been given that no more of this type of machine were to be sent to France.

Mr. Tennant replied that the answer was in the negative.

May 2—*The Air Service*—Replying to Mr. E. Cecil (U., Aston Manor), who asked whether any action had yet been taken on Lord Curzon of Kedleston's recent report to the Cabinet on the organisation of the Aviation Department; and to Sir H. Dalziel, who wished to know on what motion the Air Service debate would take place, Mr. Asquith said: My hon. friends will see from the statement of business which I am about to make that it will not be possible to give a day for this debate during the present week. I must therefore defer my answer to these questions till next week.

May 3—*Zeppelin Raid*—Mr. Tennant, replying to Sir H. Dalziel (L., Kirkcaldy Burghs), said that a Zeppelin crossed the coastline in the East of Scotland and dropped 17 bombs on agricultural land. The resulting casualties and damage were *nil*.

Mr. T. Taylor (L., Lancashire, S.E., Radcliffe): Can the right hon. gentleman add anything about Zeppelins which crossed Yorkshire during the night?

Mr. Tennant: I have not got full particulars.

May 4—*De Keyser's Hotel*—Mr. Harcourt (Lancashire, N.E., Rossendale), in reply to Mr. Ashley (U., Lancashire, N., Blackpool), said: De Keyser's Royal Hotel, Victoria Embankment, has been taken over for occupation by the Aeronautical Department of the War Office. No estimate of cost of adaptation has yet been framed. The premises have been requisitioned under the Defence of the Realm Act, and the question of compensation will therefore be settled by the Commission specially appointed to deal with such cases.

Mr. Ashley: Is the House to understand that no accommodation of a less expensive character is to be found nearer to the War Office than this enormous hotel?

Mr. Harcourt: That is so.

PROGRESS AT THE FLYING SCHOOLS

The Hall School—Three certificates taken by the Hall School last week. Pupils receiving instruction during the week: Smith, Cosgrave, Mahonev, Duncan, Glegg, Milburn, Halliday, Rochford, Dickson, Rand, Hooker, Pennell, Capt. Deane, Collier, Gaskell, Dodds, Neal, Armitage, Illingworth, Davies, Robinson, Thom. Royal Aero Club certificates taken by Neal, Thom, Milburn. Instructors for the week: P. G. Allen, C. Bell, C. M. Hill, H. F. Stevens.

HONOURS FOR THE R.N.A.S.

FOREIGN DECORATIONS

The King has granted authority for the wearing of the following decoration conferred by the President of the French Republic:—

CHEVALIER OF THE LEGION OF HONOUR

Lieut.-Commander A. M. Longmore, R.N., late Wing Commander R.N.A.S.

MENTIONED IN DISPATCHES

The following officer of the R.N.A.S. was included in the names, which through various causes could not be included at the time, is now added to the list of officers and men mentioned in General Sir Ian Hamilton's despatch of December 11, 1915 (published in a supplement to the *London Gazette* dated January 28, 1916):—

Major R. E. T. Hogg, C.I.E., 38th King George's Own Central India Horse, attached R.N.A.S.

CASUALTIES

ROYAL NAVAL AIR SERVICE

KILLED

April 28
Broad, Flight Sub-Lieut. Dennis G., R.N.
Boddy, Flight Sub-Lieut. Andrew J., R.N.

ACCIDENTALLY KILLED

April 30
Liddle, Probationary Flight Sub-Lieut. Thomas R., R.N.

MISSING

May 4
Greensmith, Flight Sub-Lieut. Reginald E., R.N.
Allen, Probationary Flight Sub-Lieut. Kenneth M. van, R.N.

INJURED

May 3
Proctor, Probationary Flight Sub-Lieut. Alexander McN., R.N.

DROWNED

May 4
Walmesley, Flight Lieut. Oswald N., R.N.

May 5
Simms, Flight Sub-Lieut. Herbert, R., R.N.
Mullens, Sub-Lieut. Cyril J. A., R.N.V.R.

SLIGHTLY INJURED

Marlowe, Prob. Flight Sub-Lieut. Augustine F., R.N.

SLIGHTLY WOUNDED AND TAKEN PRISONER

April 26
Gasson, Flight Sub-Lieut. Cecil B., R.N.
Flight Sub-Lieut. Reginald E. Greensmith, previously reported as Missing, May 4, is now reported Not Missing.

ROYAL FLYING CORPS

KILLED

April 26
Mitchell, Second Lieut. James, R.F.C.

Undated
Mitchell, Capt. E. H., Royal Artillery and R.F.C.

DIED OF WOUNDS

Undated
Milner, Second Lieut. J., Durham L.I., attached R.F.C.

PREVIOUSLY OFFICIALLY REPORTED MISSING, NOW UNOFFICIALLY REPORTED KILLED

Barrington-Kennett, Major V. A., R.F.C.

WOUNDED

Foggin, Second Lieut. C. E., R.F.C.

Rowden, Second Lieut. C. P., Worcestershire Regt., attached R.F.C.

Tankerville-Chamberlayne, Second Lieut. P. R., Hussars and R.F.C.

Vickery, Second Lieut. H. C., West Yorkshire Regt., attached R.F.C.

Shives, Second Lieut. R. K., R.F.C.

Bush, Second Lieut. G. S., R.F.C.

Harris, Second Lieut. N. B., R.F.C.

Harris, Lieut. S. H. B., R.F.C.

Monckton, Second Lieut. C., Royal Irish Fusiliers and R.F.C.

PREVIOUSLY OFFICIALLY REPORTED MISSING, NOW UNOFFICIALLY REPORTED PRISONER

Piper, 470 Corp. N. V., R.F.C.

At an inquest at Eton Wick, Bucks, held on May 2, on the body of Lieut. Alfred Boag, aged 32, who was killed while flying on April 29, it was stated that the machine was struck by a sudden gust of wind about 100 feet from the ground and the pilot lost control. A verdict of "Accidental death" was returned. (Lieut. Boag's death was reported in our issue of May 3.)

An inquest was held at Edmonton on May 2, concerning the death of Probationary Flight Sub-Lieut. Thomas Robson Liddle, aged 20, who was killed whilst flying on May 1. Deceased came from Canada, where he had done a little flying before coming to England in September last. He got his certificate on April 2. On Sunday (May 1) he went up in a Curtiss machine, and had a twenty minutes' flight. A little later he went up again, the machine being perfectly sound. A young officer described what took place. Deceased was going along beautifully, when he took a left-hand turn, side-slipped, and turned upside down. He flew upside down for half a minute, but that necessarily was not dangerous if he had had sufficient distance to right himself. Before he could effect the operation completely, the machine took an absolutely vertical nose-dive and fell upon the railway line, killing him instantly. A warm tribute to the deceased's ability and daring was paid by his commander. He was one of the most

promising members of the school, and was an exceedingly good flier. A verdict of death by misadventure was returned, sympathy being expressed to deceased's relatives and friends in Canada. (Lieut. Liddle's death was also reported in our issue of May 3.)

APPOINTMENTS

ROYAL NAVAL AIR SERVICE

Flight Commander:

C. H. K. Edmonds, D.S.O., to *President*, additional, for Special Service in R.N.A.S. : May 5.

Acting Sub-Lieuts.:

C. S. Colton and H. V. Drew, both graded as Flight Sub-Lieuts., seniority of March 15.

The following have been entered as Probationary Flight Sub-Lieuts., seniority as stated:

W. Lodge : March 19.

D. H. Masson : March 21.

G. T. Bysshe, W. S. Oliver : March 22.

W. M. Alexander : March 23.

Temporary Commissions (R.N.V.R.) have been granted to the following, seniority of May 1:

P. Hutchinson (Warrant Officer, 2nd Grade, temp.), as Lieut.; C. J. R. Alsford, as Sub-Lieut., and appointed to *President*, for R.N.A.S.; L. G. Frise, J. G. M. Bevan, and R. M. Botley, all as Sub-Lieuts., and appointed to *President*, additional, for R.N.A.S.

Acting Flight Lieut. D. R. Thurstan confirmed as Flight Lieut. : February 12.

E. C. Horsley granted a temp. commission as Lieut. (R.N.V.R.), with seniority of May 3, and appointed to *President*, additional, for R.N.A.S.

Lieut.-Commander:

J. W. L. Hunt, granted acting rank of Commander, with seniority of May 1.

ROYAL FLYING CORPS

Following appointments are made:—

Central Flying School—Assistant Commandant (graded as Wing Commander):

Lieut. (Temp. Major) E. L. Conran, 21st Lancers, a Squadron Commander, vice Capt. (Temp. Lieut.-Col.) C. G. Hoare, 39th Horse, I.A. : April 2.

Wing Commanders (from Squadron Commanders), and to be Temp. Lieut.-Cols. whilst so employed:

Major F. W. Richey, R.A. : April 11.

Capt. (temp. Major) C. F. de S. Murphy, Royal Berkshire Regt. : April 12.

Wing Adjutant:

Major M. Freeman, Worcestershire Regt., S.R., vice Major N. D. K. MacEwen, Argyll and Sutherland Highlanders : April 1.

Capt. H. N. Walker, Welsh Regt., and to be seconded : March 4.

Sergt. J. A. Pritchard, from Westmorland and Cumberland Yeomanry, T.F., to be Temp. Second Lieut. for duty with R.F.C. : March 14.

Brigade Major:

Capt. G. Livingstone, 3rd London Regt., T.F., from a Wing Adjutant, R.F.C., vice Capt. B. C. Fellows, retired pay, Indian Army : April 18.

Squadron Commanders (from Flight Commanders), and to be Temp. Majors whilst so employed:

Capt. R. G. D. Small, Leinster Regt. : April 1.

Temp. Capt. G. A. K. Lawrence, D.S.O., R.A.; Capt. J. E. Tennant, Scots Guards; Capt. J. B. T. Leighton, Scots Guards; Capt. R. M. Vaughan, Royal Inniskilling Fusiliers; Capt. C. S. Burnett, Reserve of Officers : April 2.

Temp. Capt. A. E. G. MacCullum, General List : April 14.

Flight Commanders, and to be temp. Capts. whilst so employed:

Lieut. C. R. Rowden, Worcestershire Regt., from a Flying Officer : April 17.

Temp. Lieut. W. R. Nelson, General List, from a Balloon Officer : April 18.

Flight Commanders (from Flying Officers), and to be Temp. Capts. whilst so employed:

Lieut. N. M. Martin, 38th Cent. Ind. Horse, I.A.; Temp. Lieut. N. C. Sampson, General List; Lieut. A. M. Wynne, S.R.; Temp. Second Lieut. O. S. Mosley-Leigh, General List; Second Lieut. J. H. Herring, S.R. : April 2.

Second Lieut. C. C. Miles, S.R. : April 13.

Second Lieut. C. E. H. Medhurst, Royal Inniskilling Fusiliers; Second Lieut. J. A. Soames, Royal Welsh Fusiliers : April 15.

Temp. Lieut. H. B. R. Rowell, R.E., T.F. : April 16.

Temp. Lieut. A. W. H. James, 3rd Hussars; Temp. Lieut. G. H. Norman, General List; Lieut. E. P. Plenty, Manchester Regt.; Second Lieut. R. F. S. Morton, Special Reserve : April 18.

Equipment Officers (from Assistant Equipment Officers), and to be Temp. Capts. whilst so employed:

Temp. Lieut. A. Cleghorn, R.E., T.F.; Second Lieut. S. L. Dashwood, R.E., T.F.; Second Lieut. S. C. Callaghan, S.R.; Second Lieut. F. Shumaker, S.R. : April 14.

Equipment Officers, and to be Temp. Capts. whilst so employed:

Qmr. and Hon. Lieut. J. Mead, from an Assistant Equipment Officer : April 15.

Temp. Lieut. S. J. Radford, Army Ordnance Dept., and to be transferred to General List : April 22.

Flying Officers:

Temp. Capt. F. D. Berridge, Dorset Regt., and to be transferred to General List; Lieut. C. L. Bath, Canadian Motor Machine Gun Service; Lieut. T. McD. Hawker, Royal Irish Fusiliers, S.R., and to be seconded; Temp. Second Lieut. G. H. Wilkinson, East Kent Regt., and to be transferred to General List; Temp. Second Lieut. E. C. Winkley, East Surrey Regt., and to be transferred to General List; Second Lieut. E. J. Watkins, S.R.; Second Lieut. C. J. Creery, S.R. : April 11.

Second Lieut. J. O. Archer, R.F.A., Special Reserve, and Lieut. N. H. Bottomley, East Yorks Regt., Special Reserve, and to be seconded : April 12.

Temp. Second Lieut. J. D. Seal, General List : March 29.

That portion of the notification in *Gazette* of February 4, 1916, which relates to Lieut. G. J. L. Welsford, Middlesex Regt., and Second Lieut. H. F. C. Cannell, General List, is cancelled.

Flying Officer (Observer):

Lieut. J. R. Dennistoun, Canadian Local Forces, from Canadian Cavalry Depot : April 17.

To be Temp. Second Lieuts. for duty with R.F.C.:

Sergt. S. Smith, from Liverpool Regt., T.F.; Sergt. A. V. Boiteux-Buchanan, from A.S.C.; Corpl. H. J. Larkin, from 1st Signal Troop, Australian Engineers, Australian I.F.; Pte. O. B. W. Wills, from H.A.C. : April 22.

Corpl. R. T. Barlow, from Canterbury Inf., N.Z. Forces, to be Temp. Second Lieut. for duty with R.F.C. : April 22.

Balloon Officers:

Lieut. D. C. L. Speed, K.R.R.C., and to be seconded; Temp. Lieut. O. Hook, Gordon Highlanders, and to be transferred to General List; Second Lieut. P. S. Kershaw, Special Reserve : April 1.

Lieut. G. F. H. Faithfull, 126th Baluchistan Infantry, I.A., from Temp. Capt., Royal Scots; Second Lieut. G. C. Levick, K.R.R.C., and to be seconded; Capt. J. P. Shelley, Royal Lancashire Regt., and to be seconded; Temp. Second Lieut. G. S. D. M. Pape, Gordon Highlanders, and to be transferred to General List; Temp. Second Lieut. G. K. Simpson, General List; Second Lieut. H. P. L. Higman, R.E., T.F.; Temp. Second Lieut. I. Kenzie, East Yorks Regt., and to be transferred to General List : April 3.

Temp. Second Lieut. G. W. Lynn, 22nd Middlesex Regt., and to be transferred to the General List : April 12.

Second Lieut. R. G. Cookson, Special Reserve; Second Lieut. P. B. Moxon, Special Reserve : April 18.

Assistant Equipment Officers:

Temp. Second Lieut. D. P. Geddes, General List : April 7.

Temp. Second Lieut. W. C. Nichol, General List : April 17.

Second Lieut. (on probation) J. M. Furnival, Special Reserve : April 20.

Lieut. D. C. James, Worcestershire Regt., Special Reserve, and to be seconded : April 27.

The Christian name of Qmr. and Hon. Lieut. (Temp. Capt.) Albert Levick is as now described, and not as in the *Gazettes* of March 22, 1915, and February 16.

SPECIAL RESERVE

Second Lieuts. to be Lieuts.:

E. S. Skipper, G. H. B. McCall, L. M. Wells Bladen, G. S. M. Insall, V.C., G. Merton, C. F. Collett, P. E. L. Gethin : April 1.

Following Second Lieuts. (on probation) are confirmed in rank:

W. J. Sinclair, R. M. J. Dunphy, G. A. Curtis, E. J. Watkins, C. J. Creery.

To be Second Lieuts. (on probation):

F. H. O'Beirne, H. S. Pell : March 25.

D. B. Sanders : April 11.

W. S. Roberts : April 18.

H. V. Rabagliati, T. Perkins, R. H. Edwards, G. D. Harrison, W. S. Shirtcliffe, D. C. Bauer, G. Lea, R. H. Lownds, S. G. Howard, A. P. Adams, E. D. Spicer, P. Thompson, Capt. H. S. Lees-Smith, Defence forces of the Union of South Africa; G. V. Aimer, J. D. Hewett, W. F. Williamson, J. C. Burney-Cumming : April 22.

To be Second Lieuts.:

P. B. Moxon : March 4.

P. S. Kershaw : March 18.

Second Lieut. (on probation) R. G. Cookson confirmed in rank.

Second Lieut. (on probation) W. O'Hara relinquishes his commission : April 17.

RATES OF PAY FOR OBSERVERS

An Order in Council, published in the *London Gazette*, makes provision for extra pay to officers and men, whether belonging to the Royal Naval Air Service or not, who may be employed by the Admiralty as observers in aircraft. Trained observers, if commissioned officers and midshipmen, when actually detailed as observers, are to receive 5s. a day continuously; warrant officers, 3s. a day for days of ascent only; petty officers and men, 2s. a day for days of ascent only. These rates are to be issued continuously to warrant officers, petty officers, and men employed as observers in an area of operations.

Officers, warrant officers, petty officers and men under training as observers will be entitled to extra pay; commissioned officers and midshipmen to 3s. a day for days of ascent only; warrant officers to 2s. a day for days of ascent only; petty officers and men to 1s. a day for days of ascent only.

Officers, warrant officers, petty officers and men not graded in the Royal Naval Air Service, when required to ascend on duty as casual observers or passengers, will receive: Commissioned officers and midshipmen, 5s. for each day of ascent; warrant officers, 3s. for each day of ascent; petty officers and men, 2s. for each day of ascent.

Graded officers, warrant officers, petty officers and men are eligible for these rates of extra pay unless entitled as qualified pilots to flying pay at higher rates.

IMPERIAL AIRCRAFT FLOTILLA

The members of the Over-Seas Club are celebrating Empire Day, 1916, by presenting to the Royal Flying Corps a number of biplanes.

The following are the most recent gifts subscribed to the Imperial Aircraft Flotilla:—

Nos. 58 to 60, £1,500 each—"Manya Krobo," presented by the chiefs and people of Eastern Krobo, Gold Coast; "New Juaben," by the head chief, chiefs, and people of the New Juaben Settlement, and "Saran," by the residents of Saran, through the District Officer, Mr. F. M. Luce, I.C.S.

No. 61—"Jamaica No. 2," £2,250, presented by the people of Jamaica, through the Jamaica Aeroplane Fund Committee.

No. 62—"John Macaulay" (native of Edinburgh), £1,500, presented by Mrs. H. P. Stromberg, in memory of her late father.

Nos. 63 to 68—£1,500 each, "Over-Seas Club Empire Day, 1916, Nos. 1 to 6," all presented by members of the Over-Seas Club.

Since last Empire Day 68 aeroplanes have been presented to the British Government through the medium of the Over-Seas Club. The sum of £1,500 has been contributed by the Omanhene, chiefs, and people of Kwahu in the Gold Coast Colony, for the purchase of an aeroplane for presentation to His Majesty's Forces. This is the eighth aeroplane to be presented by the private generosity of persons in this colony.

WAR PAINT

At heart we are all of us savages and love to deck ourselves out in our war-paint whatever the nature of the operations in prospect, whether it be the hunting of the wily Hun or a lady-killing expedition. But there is always this difference; whereas peace-time clothes are only made to be seen and to strike terror and admiration into the heart of the opponent, the real war-paint is designed primarily for the wearer's comfort, and thereby for the increase of his fighting efficiency. And this is more especially true of aviation. It is literally a fact, which only those who have flown can fully appreciate, that a properly clothed aviator is in the long run twice as efficient as the bird-man whose raiment may be gorgeous to the eye but is singularly ill-fitted to stand the rigours of the air, especially during prolonged flights at the high altitudes imposed by the war. Warmth, of course, is the first essential, that combined with lightness, or at all events complete freedom of movement for the wearer. Many and strange are the varieties of clothes affected by the race of flying men, but though every pilot has his own preferences in matters of detail, he will, if wisdom guides his footsteps, wend his way for the purchase of his kit to some firm of recognised standing which has made a special study of his requirements; he could certainly not do better than to seek the advice of Messrs. Robinson and Cleaver, of Regent Street, W., who have made aviation kit a specialised branch of their activity. As a preliminary, and since it may afford him a useful standard of comparison, he might with advantage obtain from this firm the booklet entitled "War-Paint," which will give him full details of the manifold articles of aviation kit they supply and always have in stock.

THE INSTITUTION OF AUTOMOBILE ENGINEERS STANDARD STEEL SPECIFICATIONS FOR AUTOMOBILE CONSTRUCTION

It will be remembered that in December, 1914, a meeting was held by the Institution of Automobile Engineers in Birmingham, and an invitation was issued to all those interested in the manufacture of steel as far as it concerns automobile engineering. At this meeting a paper was read by Mr. L. H. Pomeroy emphasising, among other things, the need for a reduction in the number of steels then in use in automobile construction and also for a better understanding between automobile engineers and

steel makers. A good deal of interest was aroused among the steel manufacturers and stampers, and the outcome of the meeting was the appointment of a committee consisting of steel manufacturers, stampers and automobile engineers. As a result of less than twelve months' labour this committee has suggested a series of ten standard steel specifications for use in automobile construction, and these specifications have now been finally approved by the Engineering Standards Committee and are being issued by that body.

At the next meeting of the Institution of Automobile Engineers, which is being held at the Royal Society of Arts on May 10, Mr. L. H. Pomeroy, who has acted as chairman of the committee mentioned above, will read a paper dealing with these specifications, setting forth the reasons which led to the adoption of the particular steels chosen and specifying the uses to which each of the steels may be put. This paper will form an important adjunct to the standard specifications as issued by the E.S.C., and as the matter is one of great importance to automobile engineers and manufacturers as well as the steel and stamping industries, a large and representative attendance is anticipated. The subject certainly forms a fitting close to the session, as it brings to light the task which has occupied the efforts of the Institution for some time past, though nothing has hitherto been published in this connection pending its successful completion. Though involving much labour on the part of the committee, there is no doubt that the result will prove of great benefit both to steel makers and automobile manufacturers, and will provide a great impetus to the production of automobile steel in this country after the war.

PATENT INFORMATION

This list is specially compiled for AERONAUTICS by Messrs. Rayner and Co., Registered Patent Agents, of 5, Chancery Lane, London, from whom all information relating to Patents, Designs, Trade Marks, etc., can be obtained gratuitously.

LATEST PATENT APPLICATIONS

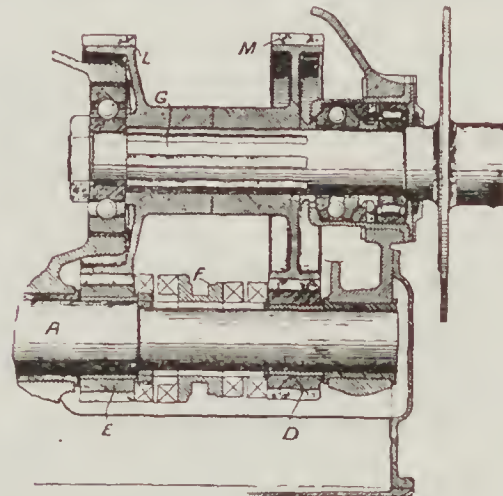
- 5,766 E. M. Parker. Device for control of angle of aircraft. 20/4/16.
- 5,697 T. Rigby. Arrangement of anti-aircraft guns. 19/4/16.
- 5,857 Rolls-Royce, Ltd. Car framework of aircraft. 20/4/16.
- 5,812 F. T. Tucker. Apparatus to inform aviators of approach to surface of sea or land in the dark. 20/4/16.

SPECIFICATION PUBLISHED THIS WEEK

- 7,686 Christianson. Aeroplanes and like aircraft.

LATEST PUBLISHED ABSTRACT

- 77 "Aeronautics." Sunbeam Motor Car Co., Moorfield Works, Wolverhampton. Variable speed gearing for the propellers or aircraft is arranged in an extension of the engine crank casing. On an extension A of the crank



shaft are loosely mounted two pinions, D, E, either of which can be made fast to the shaft by a clutch F. The pinions gear with wheels M, L, keyed on the propeller shaft G, which is fitted with ball and thrust bearings.

Printed copies of the specification and abstract can be obtained from Messrs. Rayner and Co. at the price of 1s.

COMPANY NEWS

REGISTRATION OF NEW COMPANIES

AIRCRAFT, PROPELLER AND ENGINEERING CO., LTD. (143,625).—Private company registered April 17. Capital £1,000, £1 shares. To take over the business of the Aircraft Engineering Co., manufacturers of and dealers in aircraft, aircraft parts and materials and appliances of all kinds, etc. Agreement with W. H. Clegg. Directors: W. H. Hampton and C. Jefferies (both permanent). Qualification (except first directors) £100. Secretary, W. H. Clegg. Solicitor, G. Wallington, 15, Great James Street, Bedford Row, W.C.

LONDON AND KINGSTON BOAT AND MOTOR WORKS, LTD.—Capital £20,000, in £1 shares. Aeronautical, electrical, motor, and general engineers. Minimum cash subscription £100. First directors, G. St. L. Mowbray and J. G. Bickford.

AERONAUTICS

A WEEKLY JOURNAL DEVOTED TO THE TECHNIQUE OF AERONAUTICS

(FOUNDED 1907)

Edited by JOHN H. LEDEBOER, B.A., A.F.Ae.S.

VOL. X. No. 135 (NEW SERIES)

MAY 17, 1916

* [Registered at the G.P.O.]
as a Newspaper

ONE PENNY

THE INDUSTRY, THE STATE, AND THE ROYAL AIRCRAFT FACTORY—III.

AT some length we have examined the relations now existing between the Industry, the State, and its appanage, the Royal Aircraft Factory—which has arrogated unto itself or become possessed in some mysterious fashion of the functions of Pooh-Bah. For these last few years, environed by the din of political controversy and amid the cymbal clash of the contending parties at the hustings, one has rather lost sight of the true inwardness, connoting the honest portion, of these affairs. It is the greatest pity in the world that aeronautics wilfully and of malice aforethought (as I cannot help thinking) has been imported into the realm of politics. Yards of flowing language in Hansard, infinitive efforts in Parliamentary intrigue, are not worth the price of a single aeroplane. Into this atmosphere of politics, which even the war has not succeeded in cleansing, let us try—so far as aeronautics is concerned—to infuse one vivifying element: a real perspective of the truth of affairs.

* * *

Without regard to personalities, I beg to state, as the polite letter-writer has it, that we are and have been—speaking from the view-point of the industry, and even more from that of the Air Services—singularly ill-served in the matter of our political representatives, who constitute our only voice since the very effectual muzzling of the Press. The whole of their trouble—and ours—has been that, bluntly, they have not known what they are talking about, and have had their facts given to them by contending parties (*yclept* industry and officials), between the truth of whose claims they are unable to judge for themselves. It is no use blinking the fact that there has been great unrest among the public in regard to our aerial disorganisation and in regard to the inefficiency of our preparations to meet aerial attack on these islands, which, be it added, is the smallest part of the problem of the air in so far as it concerns us. Not only must that unrest be allayed, but the public must be induced to consider the problem in its proper perspective, and in the light of a slight integral part of the world-wide war.

* * *

As such, it falls naturally under three headings, two of which have already been considered in full* in these columns. Not until public opinion realises the foundations, the possibilities—aye, and the present limitations—of aerial navigation, and the true inwardness of their being, as at present they are constituted in this country, can it through its Parliamentary representatives and the Press voice its own opinion. Of the fact that our aerial organisation has been grossly mismanaged since its very precarious inception there can be no doubt whatever; that manifold abuses are still rampant it would be idle to deny. But who has yet suggested an alternative and workable

scheme—workable and capable of being put into execution during the duration of the war and the upheaval of all our social institutions? Let me say at once that the executive and administrative officers of our Air Services have done their best—and a glorious best, too—under almost unparalleled difficulties and in the face of the most intense political antagonism. It is a point one—and especially the newspaper pundit who has derived a smattering of informative complaints from subalterns or disappointed seniors—is apt to forget. Let us pay our tribute, then, to Sir David Henderson and his predecessors, whose task was one of thankless innovation, to General Trenchard, and to General Brancker, who, severally and conjointly, surely constitute an ideal executive and administrative combination in which everyone places the utmost faith; let us, in brief, leave the executive and administrative branches of the Royal Flying Corps—which, be it remembered, are composed of officers, and are, therefore, precluded from the privilege of defending themselves publicly—and turn to a branch of their constitution which, in our eyes, is of infinitely greater and immediate importance to the conduct of the aerial war at large and to the efficient progress on reformed lines of the aircraft industry in particular. The conduct of war must, perforce, be left to the professional conductors; but modern warfare has shown itself to be at least as much an affair of industrial organisation as of purely military operations in the field. The industrial magnate and organiser has become the equal in the power to determine events of the military commanders; more, he has become the dictator.

* * *

It is necessary to realise this cardinal fact before we can come to any conclusions regarding modern warfare and aerial warfare in particular. In other words, and to put it plainly, man-power and strategical ability have to bow their heads before industrial organisation. Reduced to terms of practical politics, this simply means that a country may possess the most perfect aeroplane or other form of aircraft in the world, and yet may be beaten—assuming that air superiority can bring about a military decision, which it cannot at the present time—by an enemy possessing unlimited industrial productivity, even allowing its products to be inferior in individual quality. Even Lanchester's "*n*-square" law will prove the point.* In other words, the whole matter of supremacy, *ceteris non paribus*, ultimately resolves itself into a question of industrial organisation and resource. A temporary success may be achieved by purely military means, by superior strategical or tactical ability; but, from the very nature of things, it cannot be decisive. Taking aerial warfare alone, the in-

* "Aircraft in Warfare," by F. W. Lanchester, Constable and Co., 1916.

ustrial capacity of a country at war is only capable of deciding the issue in the long run.

* * *

All this is a digression, and yet a necessary one. It helps—if it serves no other purpose—to place matters in their proper perspective, and will do as a necessary introduction—since no one has yet advanced the point—to the consideration of the broader problems of warfare of the present and the future.

* * *

And yet here a word of warning is necessary, the more so since, at first sight, it is directly at variance with all our aims and claims to further the interests of the air and its industry. Moreover, in these days, when politicians and others spin endless sentences regarding the *determining and decisive* influence of aircraft—provided in the requisite quality or in the necessary numbers (according to the individual estimate in question)—it is necessary (though I say it, as shouldn't) to state clearly, firmly, and fearlessly that aircraft, whatever their number or efficiency, *cannot win this war, and cannot even bring about a decision*. They may, and will, given proper numbers and adequate organisation, help to win a decision, but win it by their own proper virtue they cannot. And the merest tyro knows that the outcry for a raid by 10,000 or 50,000 aeroplanes is the merest phantasy of a megalomaniac dreamer. Apart from practical and, at the present time, insuperable practical flying difficulties, such achievements are—speaking from the

(To be continued)

industrial point of view—simply impossible. And hence they conjure up in the public mind a vision, doomed to disappointment, of a deciding influence in warfare won by aerial supremacy. As a matter of fact, as things go nowadays, the wastage of aeroplanes is greater than the demand for new supplies, as the Hun has experienced to his cost to an even greater extent than we have, possessing, as we do, the better material and pilots.

* * *

Ten years hence things may be different; but, though they may and will be assisted, they cannot be decided now purely by aerial supremacy. Ten years hence, I say, they may be; and the nation which holds the air may police the world. But only through the means of organisation of the aircraft industry and by wisely providing for its expansion. Our present inadequate system is totally incapable of achieving that end; hence these preliminary words in the present discussion may serve as an introduction to the promised scheme of reorganisation which it is proposed, notwithstanding political debates and vapourings, to elaborate hereafter. That this discussion may not be wholly devoid of merit or result is proved by the fact that the need for an Air Minister and a co-ordinate Air Department was first voiced in these columns over three years ago. By the time these words appear in print that issue should be settled. Take the credit whosoever will. Our present concern lies with the industry.

J. H. L.

ROYAL FLYING CORPS INQUIRY COMMITTEE

THE committee appointed to inquire into and report upon the administration and command of the Royal Flying Corps with particular reference to the charges made both in Parliament and elsewhere against the officials and officers responsible for that administration and command, and to make any recommendations in relation thereto, held a preliminary meeting on May 10 to settle procedure and such matters. They hope to begin taking evidence as to the charges on May 16 at 10.30, at No. 68, Victoria Street, Westminster. The public will be admitted. No counsel will be heard on either side. All communications concerning the committee should be addressed to the secretary, Mr. D. Cotes-Predy, 2, Elm Court, Temple. The members of the committee are:—Mr. Justice Bailhache (chairman), Mr. J. G. Butcher, M.P., Mr. E. Shortt, K.C., M.P., Mr. J. H. Balfour Browne, K.C., the Hon. Sir C. Parsons, K.C.B., and Mr. Charles Bright. Mr. Tennant also stated in the House that it was intended to invite a military officer of high rank to join the committee.

It is perhaps somewhat late in the day to discuss the constitution and membership of this committee. Its main business is to sift legal evidence and to pronounce on the allegations that have been made, allegations with which our readers are familiar, and from this point of view, the shining legal talent of the Committee is all that could be desired. Beyond the law members, we have the son of Sir Charles Bright and Sir Charles Parsons, the last named a welcome member of any committee charged with the investigation of what is, after all, mainly a technical matter.

We place not the slightest faith in the outcome of the Committee's labours; the reason for its appointment is obvious enough, and is mainly due to the extravagant nature of the charges that have been brought against the administration of the Air Services, whatever solid foundations these may have possessed in themselves. When the jerry-builder hopes to entice a tenant, he makes the house look nice by applying a coat of paint and whitewash, and the public gazes upon his finished effort with an

admiring eye; but even the most liberal application of whitewash will not hold together a building which is structurally unsound. The worst of it is that the whitewash deceives the eye, which is just the danger of a reaction in public opinion that we have foreseen all along. Moreover, it may well be doubted whether the Air Services themselves view the appointment of this lawyers' Committee with any but mixed feelings. However, perhaps this week's debates will clear the atmosphere.

J. H. L.

ENGINEERS AND THE WAR

To the Editor of AERONAUTICS

SIR,—(1) The public is well advised to beware the consequences of its action in demanding the wholesale unbadging of young engineers and technical labour engaged in munitions factories without first providing for the maintenance of their identity as skilled workers.

(2) There ought to be a Corps of Mechanical Engineers into which technical men of all grades could enlist, and from which they could be drafted to other units or back to civil life, as most needed.

(3) Such a scheme would enable the potential technical skill of such men to be retained, for the directorate of the Corps of Mechanical Engineers would be responsible for supplying technical personnel wherever required.

(4) Although the civil demand for technical skill of all kinds has steadily increased since the outbreak of war, rudderless popular sentiment has encouraged the frittering away of one of our most valuable national assets. Thousands of skilled men have been submerged in the Army; had they been enlisted into a Corps of Mechanical Engineers, the potential value of their special ability could have been realised many times over in the country's service.

(5) They say this is an engineers' war—sometimes I incline to the belief that it is time an engineer took charge of it.

A. E. BERRIMAN,
Chief Engineer of the Daimler Co

May 12, 1916.

SOME NOTES ON THE DESIGN OF AERO-ENGINES

By JOHN WALLACE

WHEN one comes to consider the large number of firms engaged in the design and manufacture of internal-combustion engines, it is astonishing to note how few have been successful in producing a satisfactory aeroplane engine. Aeroplane engines of to-day are, with very few exceptions, designed and built on the same general lines as car engines, and only differ from the latter in such comparative details as the use of steel cylinders and sheet-metal water-jackets; the factors of safety of the various parts have then been reduced as far as possible in order to obtain a low weight per horse-power developed. In other words, lightness is obtained at the expense of reliability. Consequently, nearly every aero-motor of the present time requires constant dismantling and overhauling. As to the reason for this state of affairs, one can only conclude that nobody has yet seriously attacked, in a practical manner, the problem of actually producing an engine which really meets the needs of the aeroplane. This article is written in the hope of pointing out: First, the essential features of the ultimately successful aero-motor; secondly, to show how present-day motors fail to combine these features; and finally, to suggest the lines on which a real aeroplane engine might be designed.

So far as the first part is concerned, the most essential feature of all is lightness of weight. Of course, there are many who doubt whether the aero-motor need be so very low in weight per horse-power developed, and who back up that view by pointing out the large number of heavy engines, weighing as much as 6 lb. per horse-power developed, which are now being used more or less successfully. It is quite true that such engines are giving fairly good results, but in spite of all that may be said as to the comparative unimportance of weight, it is obvious that the lighter the power unit the greater the useful load that may be carried by the aeroplane. This brings us to another point: if the "run-about" aeroplane for the private owner of moderate means is ever to be introduced, it will only be after the advent of the engine weighing $1\frac{1}{2}$ lb. or so per horse-power developed, for the simple reason that no ordinary purchaser of this type would be able to accommodate a 30 or 40 feet span machine, which might be necessary with the heavy present-day engine.

Another point directly related to that of low weight is low petrol and oil consumption. Obviously it would be useless to use an engine weighing 30 lb. less than another of equal power if it consumed another 50 lb. of fuel and oil during a given flight. An engine combining the features of low weight and low petrol and oil consumption would help to solve the problem of very long flights over sea or over country where fuel was unobtainable.

Speaking of long flights reminds us of an equally important feature as light weight, and that is reliability. We have now come to the one great difficulty which confronts the designer of the light aero-motor. How can an engine be made to possess in an equally large degree the conflicting qualities of lightness and reliability? As I have mentioned before, the majority of designers attempt to solve this problem by reducing the various component parts, by a system of trial and error, to as low a weight as is considered to be safe, and the result simply this—that the engine after this treatment weighs about 5 lb. per horse-power, and is very unreliable.

The only satisfactory method of obtaining a light and yet at the same time reliable engine is by adopting a totally different design of aero-motor, and some of the results obtained by this latter method are the rotary and fixed radial engines. However, these two types possess one great disadvantage in common, and that is a very large head

resistance. The projected area of a seven-cylinder radial engine is approximately six times as large as that of a six-cylinder vertical engine of equal power; also, the vertical motor, when placed immediately in front or behind the pilot's seat, lends itself to a much more efficient shape of nacelle, that is to say, one which possesses the minimum head resistance. But the vertical type of engine is essentially heavy for its power. So far as rotary engines are concerned, even the best of them suffer from sparking-plug and lubrication troubles, while the rapidity with which carbon deposit accumulates in the cylinder heads is positively astonishing. Could the rotary engine be water-cooled, then no doubt a lot of its present troubles would cease to exist, but a water-cooling system on this type is practically impossible. Another inherent disadvantage of the rotary motor, the importance of which has apparently not yet been realised, is the impossibility of effectively silencing this type. Up to the present it has not been deemed necessary that an aeroplane should be silent. Yet imagine for a moment the enormously increased destructive power of aircraft during this war were they but as efficiently and as effectively silenced as a first-class car. An aeroplane or a fleet of aeroplanes could travel over the Thames by night, and, having reached London, descend to a very low altitude over our Admiralty or War Office and drop their explosives before being discovered. For there would be no noise to proclaim their coming to the watchers on the coast, and consequently the searchlights on the Thames would probably not be in action. However, aeroplanes have not yet reached that sublime degree of silence, and we may sleep calmly in our beds, knowing that aviators attempting a raid on the Metropolis will at any rate be *heard* before reaching their destination.

Then, again, to discuss the importance of silent machines in the future. Whatever pessimists and other short-sighted people may say, the time is not so very far distant when travel by air will be almost as commonplace as travel by railway is at present. Let us suppose for a moment that such a state of affairs has come about, and that an extensive landing-ground has been established at Weybridge as being the air terminus for London from the south-west coast. It is obvious that the air termini could not very well be in the City itself, and would need to be in places similar in position to that which I have suggested. Suppose that the air traffic at this point had reached proportions similar to the present motor traffic on the Portsmouth Road near by, and that, say, fifty unsilenced machines were landing and an equal number of unsilenced machines were starting every hour. To say the least about it, the resulting noise would cause considerable annoyance to residents in the vicinity. Those people residing in the neighbourhood of Brooklands have frequently complained of the noise made by racing cars and motor-cycles travelling round the track with open exhausts, and the closing of the track has sometimes been threatened in consequence. But what on earth would they have to say if the aforementioned state of affairs had come about? Could the air station be removed? No. There would be but one course open, and that to effectively silence the aeroplane engines. As to how that might be done will be spoken of later on.

To revert back to the rotary motor, they possess a constructional difficulty in common with the radial type—the difficulty of attaching the connecting rods to the crank-pin in a satisfactory manner. The usual method is to attach secondary rods to one or more (according to the number of crank throws) master connecting rods. This is as unmechanical a method as is conceivable, and possesses many serious disadvantages, as is explained elsewhere in this article. Of course, it would be impracticable to fork all the

connecting rods as in twin-cylinder practice, and it would be equally absurd to stagger the cylinders separately. The reason for this last being impossible is because the radial engine owes its light weight to a very short single-throw crank-shaft, a very short cam-shaft, and a correspondingly short crank-case. Of course, the designer's art is merely one of effecting the best compromise, and such drastic alterations from standard practice as the rotary or fixed radial engine are bound to involve considerable disadvantages.

Having possibly survived up to this point, the reader will probably begin to seriously wonder whether a successful aero-motor has ever been built or not. Well, in a sense there has, but the point is that for reliability they are not to be compared with the modern car engine running under its own particular conditions, and this is so in spite of the fact that aero-engines are not yet anything like as light in weight as they will eventually have to be. I have said before that most aero-engines are to all intents and purposes car engines, and that is the cause of the whole trouble. An aeroplane motor works under vastly different conditions from those under which the car engine runs. The latter is for the most part developing less than half its maximum power, whereas the aero-motor is constantly running at the highest speed of revolution of which it is capable. The average car engine, as turned out from the factory, will not, without special tuning, run at its highest speed for very long before the pistons seize in their cylinders, or something equally serious occurs, which being the case, what on earth is the use of adopting car designs for aeroplane work? The continual building of aero-motors on present lines is keeping back the proper development of the aeroplane. There is a distinct lack of initiative and enterprise on the part of the motor trade so far as aero-engines are concerned. The majority of firms will not depart from present practice, and as for that much-despised and maligned person—the inventor-designer—he may go to the devil. The manufacturer says that he is making quite a satisfactory profit on his present models, that he cannot waste money on experimental engines: he will leave that to people with more money than sense. But, unfortunately, the inventor usually has sufficient to live on and no more, and so he goes his way disheartened, and probably finishes his days working out the insane schemes of equally insane chief draughtsmen, self-made manufacturers, and other national bugbears.

I am afraid that I am wandering from my subject, but before going back I would like to put a question before the reader—Which is eventually the better plan from the manufacturer's point of view, to keep on building engines of indifferent design, no better than most on the market, or to spend a few thousand pounds in experimental work and then to produce an engine without rival? I leave the answer to the reader's common sense.

Having pointed out some of the difficulties which beset the engineer during the designing of an aero-motor and a few of the little troubles which occur when he endeavours to get his ideas "taken up" by some short-sighted manufacturer, I will proceed to suggest the lines on which could be built an aeroplane engine in the true sense of the word.

In their efforts to secure low weight nearly every designer appears to have forgotten or more probably rejected the plan of increasing the volumetric efficiency of an engine by increasing its speed of revolution. Now, it is well known that an engine developing 100 horse-power at 1,000 revolutions per minute, for example, will, if accelerated to 2,000 revolutions per minute, give off practically 200 horse-power, provided the mean effective pressure be constant. Again, it is obvious that if that engine weighed 500 lb., it would develop in the first instance 1 horse-power for every 5 lb. weight, while in the second it would weigh only $2\frac{1}{2}$ lb. per horse-power developed. Now it is quite possible for an engine to be built whose power will increase almost directly with the speed of revolution up to a limit of about 3,500

revolutions per minute. Although I am not writing this article for my own self-advertisement, yet it might be of interest that some time ago I constructed a four-cylinder engine which practically fulfilled the above conditions and actually ran up to the enormous speed of 7,250 revolutions per minute. Of course, at this speed the mean effective pressure had fallen considerably, although the power increased directly with the speed of revolution up to almost 4,000 revolutions per minute. With the aid of a half-compression device this engine could run as slowly as 550 revolutions per minute under load. Some people will immediately suppose that the engine ran as above stated, and then flew to smithereens, but this is not so. This engine ran for long periods, but was unfortunately destroyed during a fire. An engine with as high a speed of revolutions as 3,000 is not necessarily unreliable, neither need it involve pistons and connecting rods "*à la Spider Web*." By far the greatest difficulty is that of keeping up the mean effective pressure: as to how that may be done some methods are known to designers of racing engines, while there are some others which I do not propose to advertise here. However, in passing, I would like to recommend any enterprising firm with a taste for experimental work, if any such firm exist, to turn their attention to the high-speed engine. Of course, all difficulties in design having been overcome, the fitting up of such engines is no mere assembling job; on the other hand, it calls for the utmost skill and intelligence on the part of the mechanics concerned. So far as that goes, I feel confident that if every engine after its initial test at the factory had to pass through the hands of a staff of mechanics who were thoroughly experienced in the tuning up of racing-car engines, then those engines would increase their maximum output by at least 10 per cent. There are not many people who are aware of the importance of getting the absolutely correct piston clearance for a particular engine; the average works or shop manager seems to imagine that one or two 1/1000ths of an inch either way are negligible. I remember a case during 1913 when a well-known racing motor-cyclist was unable to get his machine, which could usually do its 70 m.p.h., to exceed 55 in spite of all the means which he used, when he remembered that he had changed the piston overnight in the hope of an improvement on his former speeds. The old piston was immediately put back, and the machine regained its original turn of speed straight away. On making a very close examination of the two pistons, the only difference found to exist between them was slightly less than 1/1000th of an inch in clearance. Now, it is attention to these details which makes or mars the running of the high-speed high-efficiency engine, provided that the engine has been correctly designed in the first place. The designing of this type of motor should present no undue difficulties to the man experienced in the design of racing engines, but I would advise those draughtsmen who are engaged in adapting other people's ideas to their own firm's "cheap cars" to leave the matter to men possessing a little more brains and originality. I was speaking not long ago to a certain chief draughtsman about a new car engine which he had just "designed" (?), and he actually made a boast of the fact that he had, to use his own words, "calculated out the valve areas," whatever that may imply. One presumes that previously this gentleman had been in the habit of casting lots or of adopting similar methods when deciding upon the size of the valve ports for any particular engine. It may be of interest that this intellectual genius, who, by the way, does not know the value of b when $a = \frac{b}{c}$, is at present chief draughtsman to a well-known firm turning out aero-engines. My object in making these remarks concerning the average manufacturer and the chiefs of his staff is to offer some explanation as to why aero-motors have progressed so little during the past two years or so.

(To be continued)

REPORT NO. 3*

REPORT COVERING INVESTIGATIONS OF AVIATION WIRES AND CABLES, THEIR FASTENINGS AND TERMINAL CONNECTIONS

By JOHN A. ROEBLING'S SONS CO.

IN reference to our investigations of aviation wires and cables, their fastenings and terminal connections for stays, we have failed to find from past practice anything that would allow us to determine the best lines on which to proceed; therefore our study is not limited to any one stay design.

In making our investigation we have aimed to eliminate the use of acid and solder, imperfect bends, flattening of cable on bends, injury to wire, strand, and cord due to unskilful handling of material in the field; and based on our

stay," consisting of 7 strands twisted together forming a rope, the strands being either 7 wires or 19 wires; and the rope known to the trade as "aviator cord."

THE SOLID WIRE STAY

Figure 1

Figure 1 shows the type most generally in use. An eye or loop is formed in tinned aviator wire and a ferrule made by wrapping a thin flat strip around both wires. The free

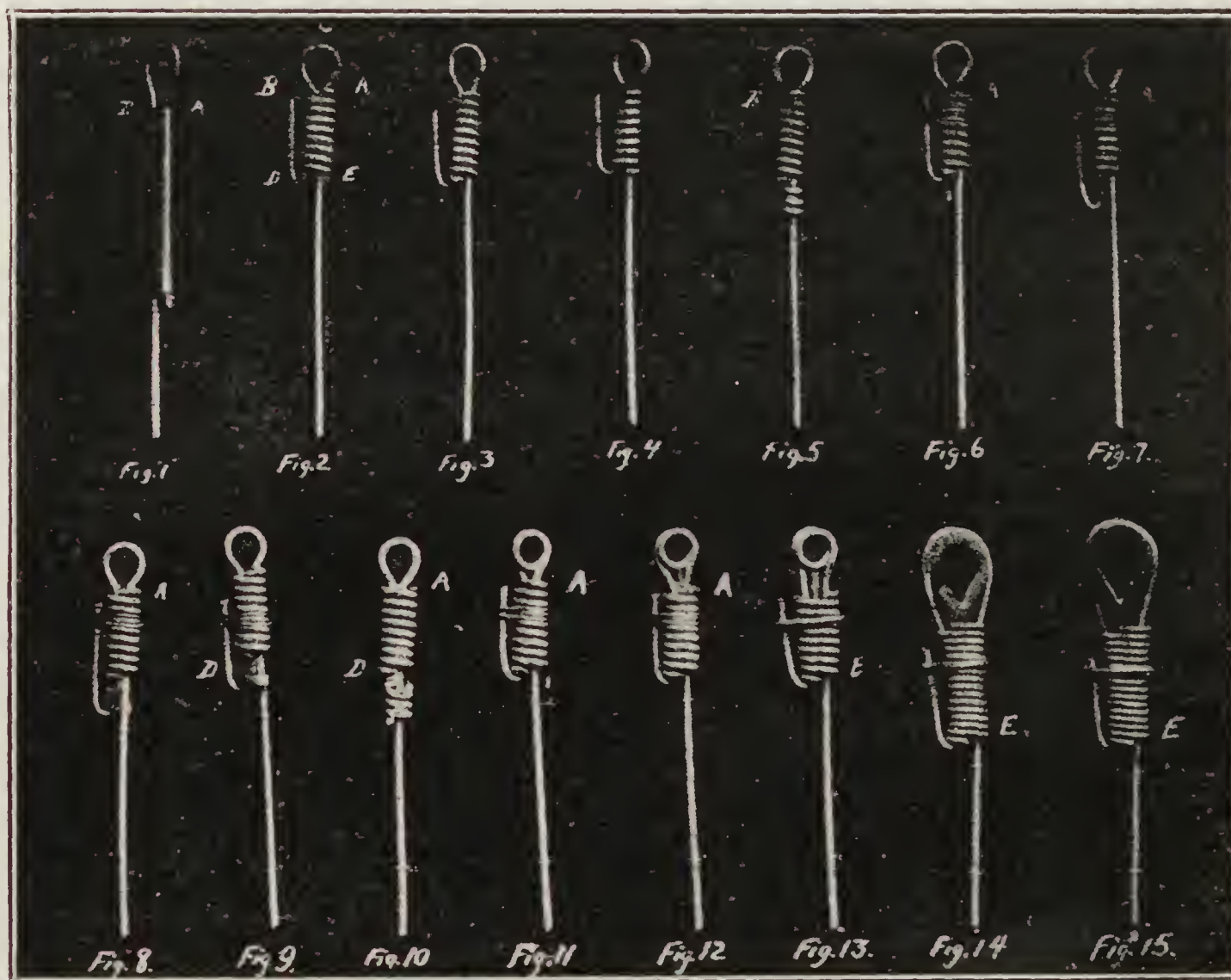


PLATE NO. 1

study of present methods of manufacture of aeroplanes we believe it is possible to manufacture the complete stay here at the factory, proof test same to 50 per cent. of its ultimate strength, measure same under stress, and therefore eliminate any uncertainty as to strength of terminal connection, length of stay, and workmanship.

On this basis our research covered not only the terminal connection for shop attachment, but also a connection that would allow repairs to be made in the field without requiring the use of blow torch and solder, and from the following tests it will be readily seen that the development eliminates any doubt on this point.

We find present practice considers "the solid wire stay," consisting of one wire of suitable diameter and known to the trade as "aviation wire"; "the strand stay," consisting of either 7 or 19 wires stranded together and known to the trade as "aviator strand"; also "the cord or rope

end of the wire is then bent back over the flat ferrule, holding it in place, and the whole terminal dipped in solder. This type of terminal is far from being satisfactory. Its mechanical strength is low and variable. The process of soldering involves the possibility of establishing a source of corrosion, as well as injuring the quality of the wire. The making of such a terminal is almost necessarily a factory proposition and provides no means for quick and efficient field replacements.

Figure 2

The standard terminal is shown in Figure 2. This consists of an oval spring wire ferrule applied in almost the same manner as the flat wire ferrule in Figure 1. Particular emphasis is placed on the method of forming the eye in the stay before applying the ferrule. Radius of curve at "A" and "B," Figure 2, must be exactly the same as radius at "C." This is called a perfect eye. No solder is used. The ferrule is made of wire of the same size as wire in stay and is "spring" quality. Nine convolutions con-

* First Annual Report of the National Advisory Committee for Aeronautics, 1915, Washington.

stitute the standard length of ferrule. The hole in the ferrule is oval, and a snug fit for the two wires forming the eye of stay. Both wire and ferrule are tin coated. The free end of the wire is bent back over the ferrule and is not fastened in any way. This holds the ferrule firmly against the shoulder at "A" and "B."

Tests made on stays having this type of terminal did not show very satisfactory results. Eighty per cent. of the tests showed an efficiency of less than 65 per cent., the free end of the wire slipping through the ferrule at failure of the stay. In the remaining 20 per cent. of the tests the wire broke at "A," the stays having an average efficiency of 68 per cent. of the total strength of the wire.

Figure 3

Figure 3 shows eye having radii "A" and "B" different from "C," which is not allowed in foreign specifications and practice. Tests made on terminals having an eye formed as in Figure 3 always resulted in pulling through the free end of the wire at low efficiency.

Figure 4

In order to determine whether the direction of pitch of the spiral spring ferrule had any influence in determining the efficiency of the stay, sample terminals having left-hand ferrules as in Figure 2 and right-hand ferrules as in Figure 4 were made with a perfect eye in both cases, tested, and compared. The left-hand ferrule clearly showed an efficiency of about 5 per cent. more than the right-hand ferrule. In testing the latter the free end of the wire slipped in every case.

Figure 5

In Figure 5 an effort was made to secure the free end of the wire against slipping when strain was applied to the stay by wrapping this end around the main stay wire. Tests on this construction showed an average efficiency of 72 per cent., fracture taking place at "B."

Figure 6

Another method of securing the loose end consisted of tying the end down on the ferrule with fine annealed wire as shown in Figure 6. Tests made on this construction showed an average efficiency of 70 per cent., fracture taking place at "A."

CONCLUSIONS BASED ON ABOVE TESTS

Observations made during tests of terminals 5 and 6 showed clearly that the weak points of this construction existed at "B" and "A," respectively, and that it was necessary to increase the friction between the walls of ferrule and the wire of the stay under strain to increase efficiency. Reliable information at hand showed that the same conclusions had been aimed at by foreign engineers stationed in America and that they had solved the problem by soldering the spring ferrule terminal in the same manner that Americans had adopted with the flat wire terminal.

HORN'S IMPROVED TERMINAL CONNECTION

In an effort to avoid the use of solder, with its many objectionable features, types of construction as shown in Figures 7 to 15, inclusive, were originated and tested. In every case the spring ferrule with left-hand pitch was adopted. The loose end of wire was secured with a tie or simple wire loop or clip as shown. Numerous tests made at intervals throughout the entire series of tests with wires having strengths of 1,600, 1,800, and 2,300 lb. showed conclusively that there is no difference in efficiency of stays using wire of any of the above strengths.

Figure 7

Figure 7 shows a wedge between the ferrule and free end of wire, so placed that as strain is applied to the stay and the bend in the free end of wire drawn toward the ferrule the wedge is forced in and thus increases the friction between the wall of the ferrule and the main stay wire. Average efficiency secured, 82 per cent.; range of efficiency, 80 to 84 per cent. Fracture at "A" in ferrule.

Figure 8

Figure 8 shows two wedges with a connecting yoke. The

wedges enter on each side between the two wires and force them apart and against the wall of the ferrule as strain is applied. The wedges are forced in by pressure on the connecting yoke which passes under the bend of the free end of the wire as this free end is drawn into the ferrule under strain. Average efficiency of terminal in test equals 80 per cent. Range of efficiency in tests made, 79 to 83 per cent. Fracture at "A."

Figure 9

In construction of Figure 9 two wedges were used as in Figure 8, but the yoke was replaced by a washer with two holes in it encircling both wires of the stay. Pressure on the wedges was supposed to be secured under strain by the drawing in of the loose end under strain. This result was not realized, as the washer became locked on the main wire and broke the loose end at "D." Efficiency secured was only 70 per cent.; range, 60 to 75 per cent.

Figure 10

In Figure 10 two wedges were used as in Figure 8 and Figure 9. The free end of the wire was wrapped around the main stay wire and pushed in the wedge as initial slippage occurred. Average efficiency, 84 per cent.; range, 75 to 87 per cent. Fracture at "A" in ferrule.

Figure 11

Figure 11 shows a double eye with no wedge. Standard straight ferrule with free end tied. This type of eye could only be used on stays when turnbuckles or hooks to be attached had open eye. Average efficiency in test, 80 per cent.; range, 74 to 82 per cent. Fracture at "A."

Figure 12

Figure 12 again shows a double eye in stay with a single wedge between wires on the eye end of the ferrule. As ferrule is drawn down against shoulders "A" and "B" the wedge is forced in. This increases friction of wires against ferrule at "A" and "B," but not at "D" and "E." Average efficiency, 85 per cent.; range, 80 to 87 per cent. Fracture at "A."

Figure 13

Figure 13 shows a construction consisting of a double eye in stay, a single wedge under the eye, and an oval spring wire ferrule tapered at the same angle as the wedge. In this case the pressure of the wedge forces both wires throughout the entire length of the ferrule against the walls of the ferrule, and this increases friction on the ferrule uniformly as the strain increases on the stay and reduces the strain at the weak points "A" and "B" proportionately. Fracture always took place at "E." Average efficiency, 94 per cent.; range, 92 to 95 per cent.

In Figure 13 we have the most efficient terminal tested. It has none of the objections of a soldered terminal. It is simple, parts are inexpensive, strong, and few in number. It is an ideal terminal for emergency use in the field.

Summary of Tests for Efficiency

Terminal.	Average Efficiency.	Range of Efficiency.	Points of Fracture.	Remarks.
	Per cent.	Per cent.		
1	80	60-90	"A" or "B"	American soldered.
2	65	60-75	"A" or slipped	Foreign, proper eye.
3	62	60-65	Slipped ..	Foreign, improper eye.
4	60	59-61	do. ..	Right-hand ferrule.
5	72	65-75	"B"	End wrapped around stay.
6	70	68-78	"A"	End tied to ferrule.
7	82	80-84	"A"	Wedge under hook.
8	80	79-83	"A"	Two wedges with yoke.
9	70	60-75	"D"	Two wedges with washer.
10	84	75-87	"A"	Two wedges end wrapped.
11	80	74-82	"A"	Double eye, no wedge.
12	85	80-87	"A"	Double eye, 1 wedge.
13	94	92-95	"E"	Tapered ferrule, double eye, wedge.
14-15 ..	94	92-96	"E"	Thimble wedge T. F single eye.

NOTE—These tests were made with wire having a diameter of 0.102 inch and a strength of 1,600, 1,800, and 2,300 pounds. No difference in efficiency of stay was found by using wire of any of these strengths.

STANDARDISATION OF PROPELLER HUBS*

By CHARLES L. LAWRENCE

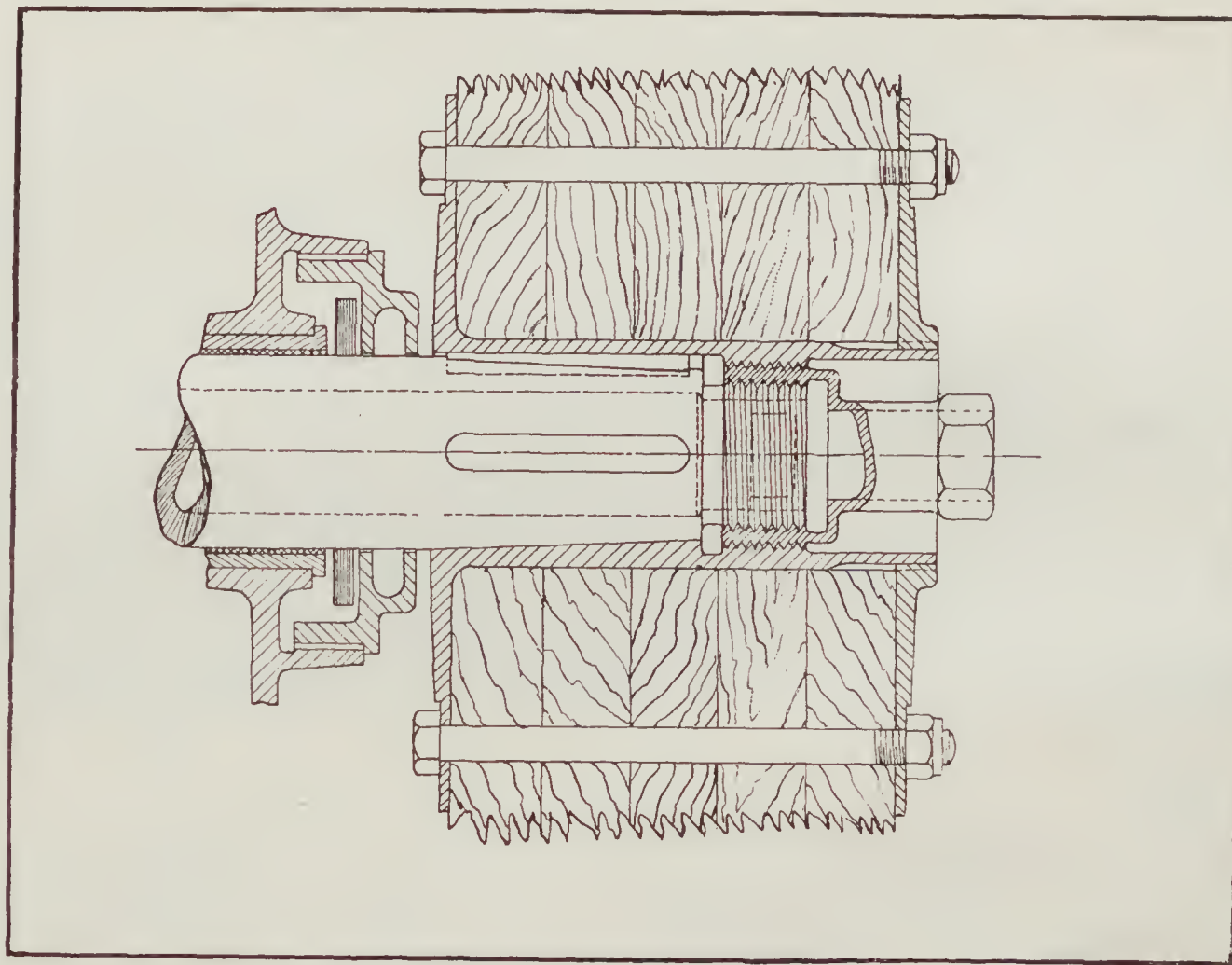
THE subject of standardisation of propeller hubs is of great importance, not only to the manufacturers of propellers, but also to users, and particularly to the Army and Navy. At the present time, in this country, no two propellers have the same hub dimensions, and thus the propeller manufacturer has to make many different models. Unless some standardisation occurs, the Army and Navy, which will soon, we believe, be large users of aeroplanes, will be forced to carry a very large stock of propellers for their various types of machines. The propeller dimensions depend not only on the aeroplane, but on the various types of engines which may be fitted to the same type of plane. In Europe this condition existed some years ago, and it remained for an enterprising propeller manufacturer, Chauvière, to design a series of standard hubs suitable for machines of different horse power, so that any propeller

every opportunity is given for crude and sloppy workmanship. I need not speak of the time which is consumed in this operation, and which is often valuable. Especially from a military point of view, it is necessary that a broken propeller should be quickly removed and another substituted.

The foreign type of hub which I am advocating, and which I would like to see standardised and adopted here as soon as it is convenient for the various manufacturers, consists of the following:—

1. The propeller hub with a tapered hole and key-ways, and with a flange at one end, very similar, in fact, to the front wheel hub of a motor car.

2. A loose flange used to clamp the propeller against the hub and which is generally slotted, so as to fit over splines on the main part of the hub, thus distributing the torque



PROPELLER HUB SUGGESTED

fitted any motor of suitable size. These hubs are separate from the engine, and the propeller and hub form a unit, which is mounted on the tapered engine shaft.

Here let me speak of the objectionable features of the form of mounting generally used in this country, which has only one point to recommend it—light weight, but which is very inconvenient. The American mounting consists of a flange turned on the propeller shaft; the propeller is clamped between this flange and another plate by means of a series of bolts. In order to mount a propeller, it is necessary to ream out the holes in the wood until the bolts can be driven through, and in removing it, if the wood has swelled, difficulty will be found in withdrawing the bolts. On the other hand, if the wood becomes very dry, there will be a certain amount of play. The inconvenience under which the men work in mounting a propeller in this way directly on the engine is very great, and

of the engine between the two flanges and allowing the bolts to do double service.

3. A special nut which presses the hub up against its taper on the shaft, and which is devised so that at the removal of the hub it can be used as a puller to withdraw the hub, which very often sticks tightly to the taper. The working of this nut is as follows:—After the propeller and hub have been put in place on the engine and pushed against the taper as tightly as possible by hand, we commence to screw on the nut. This nut screws on to the shaft with a 9 thread. On the outside of the nut is a 10 thread which engages with a thread on the inside of the hub—both threads are in the same direction. As we screw in the nut, the latter advances on the 9 thread on the shaft very slightly faster than it does on the 10 thread of the hub, so that after the nut has been screwed, say a distance of 1 in. on the shaft, that is to say, nine turns, it will have been screwed also nine turns into the hub. But as ten turns in the hub make 1 in., the hub will have been

* Read at the March 21, 1916, meeting of the Aeronautical Society of America.

forced on to the shaft 0.1 of an inch. By means of this device it is possible to force the hub on to the shaft with a very great force, equal to that which could be applied if we were using a thread of 90 turns to the inch, so that there is no danger of its every coming loose.

On the other hand, if it is desired to remove the hub, the nut when turned in the other direction acts as a puller of very great power and withdraws the hub from the shaft.

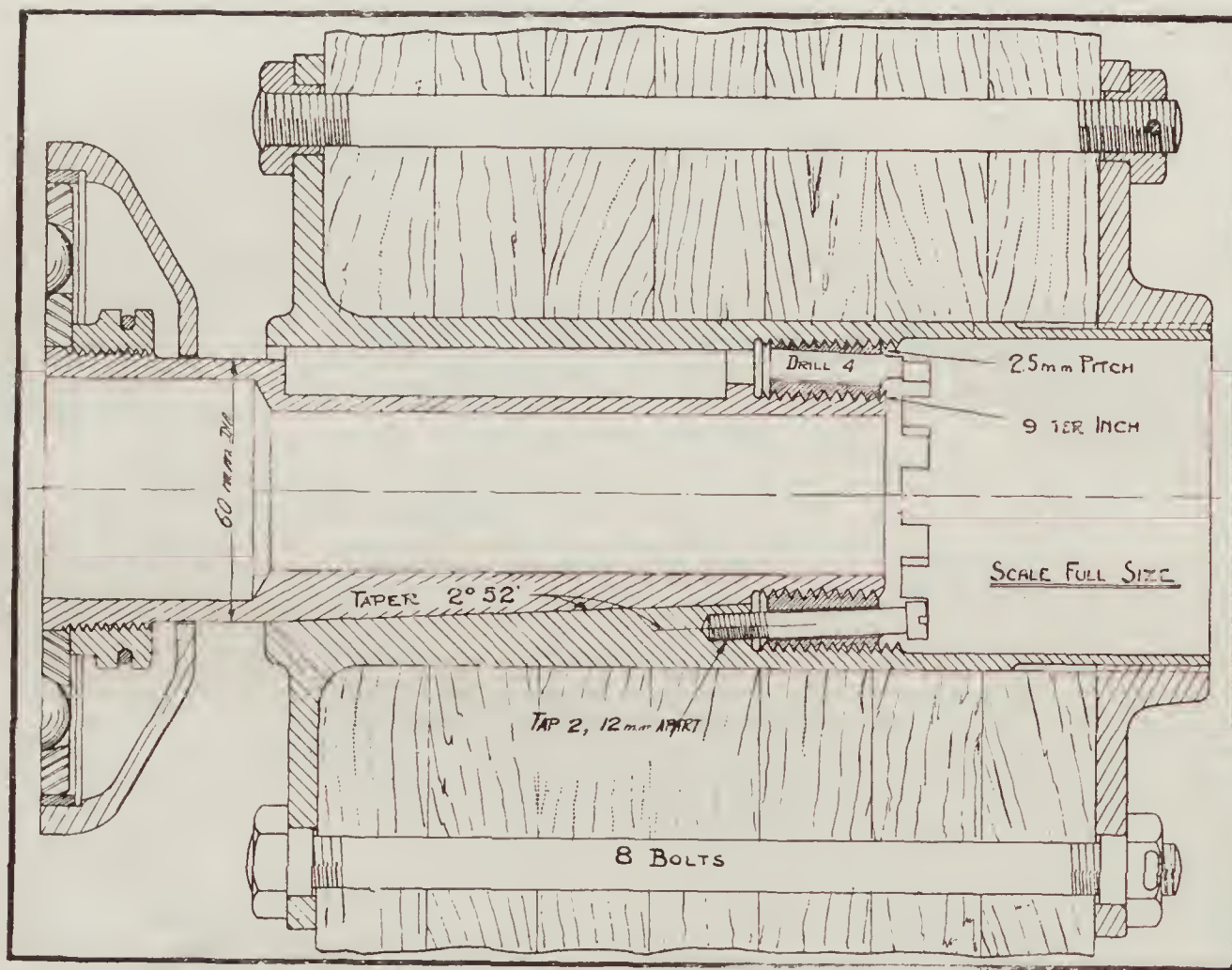
This design of hub is undoubtedly heavier than the American method of mounting propellers, but its convenience is greatly in its favour, and it has been adopted by both England and France. I have here a design for hub as used on a Salmson radial 200 h.p. engine, which will serve to explain to you the type of hub to which I am referring. Parts of this design seem rather heavy, and I think it can be improved, but I feel that in the main the design and the idea back of it is a good one, and I feel that we, in this country, cannot do better than adopt some design of this kind as a standard. It would be necessary to have various sizes, the smallest up

United States Army and Navy should also be sought in order to give this enterprise the official backing, which will help command the attention and respect of the various manufacturers.

If this plan seems a good one to the members of the Society, I believe that a committee should be formed to take up the matter of standardising of propeller hub design, to communicate with the various interested parties, to prepare designs, and finally to submit them to the Society for their approval.

Rodman Wanamaker has organised the American Trans-Oceanic Co., Inc., to build an aeroplane to cross the ocean, and a contract has been awarded the Curtiss Aeroplane Company. This is to be larger than the original *America*, have 1,800 h.p., and be able to alight and start from the ocean.

Mr. Rodman Wanamaker has since made public a letter received by him from Mr. Alan R. Hawley, President of the Aero Club of America. The following are extracts from this letter:—



STANDARD PROPELLER HUB ON AERO ENGINE

to, say, 60 h.p., from 60 h.p. to 100, from 100 to 200, and over 200. I have here a design of my own of a hub for a small machine, up to about 50 h.p.

Before any standard design can be evolved, it will be necessary to communicate with all the engine manufacturers in the United States and get the dimensions of their propeller shafts, and so design the hub that it will be large enough to fit the largest shaft of any engine, thus permitting other manufacturers either to enlarge their shafts or, if convenient, to remount the hub with a smaller hole. In designing a standard type it will be necessary to make a compromise in order to, as nearly as possible, fit the greatest number of engines, and this will involve a certain amount of correspondence. The design will have to be submitted to the various manufacturers until it meets the approval of the majority.

It will also be necessary to submit the design to the various propeller manufacturers in order to find out the size of the flange, the number of bolts, etc., and the co-operation of the

"I beg to acknowledge the receipt of your letter of April 1, in which you advise that, pursuing your purpose to build an aircraft that will cross the ocean, the America Trans-Oceanic Company, Incorporated, acting for you, has placed an order with the Curtiss Aeroplane Company for a new craft, ten times more powerful than the first *America*, of special design, adapted for alighting on and arising from rough seas, therefore eminently fitted for the trans-Atlantic flight.

"The Aero Club of America is highly flattered at the proof you have again given of your confidence in its ability to aid in this great undertaking, and begs to assure you of its hearty co-operation and of its desire to assist in every way possible.

"The aircraft you are planning, which, on account of its 1,800 h.p. and size, will be able to cross the Atlantic at a speed of about 100 miles per hour, will, we dare say, begin a new epoch, with possibilities connected therewith unlimited and wonderful.

"The placing of the order for this huge aircraft by you is a material step toward placing American aeronautics where it belongs—'ahead' of the entire world. The country that gave to the world the first practical aeroplane, the hydro-aeroplane, and the flying-boat, should be at the head in the wonderful art and science of aeronautics. The fact that this large aircraft will make it possible to solve difficult problems of transportation

affords unlimited prospects for developments, some of which may take place in the immediate future.

"From the standpoint of national defence your project is also especially valuable, as it affords the possibility of a very important addition to our defences. It is particularly commendable, as you are paying for the cost of an experiment which should be paid for by our Government."

A Committee of the Aero Club of America has investigated the possibilities of getting twenty-four aeroplanes to the Mexican border in the near future, to equip each of the aviators of the U.S. Army Aero Squadron with three aeroplanes, which is the proportion of aeroplanes allowed for each aviator in Europe, and reports the following conditions, which it submits for public consideration:—

"The Army authorities are afraid to order twenty-four aeroplanes at present to equip each of the aviators of the squadron which is in Mexico with three machines. They have not taken steps as yet to form and equip an additional Aero Squadron. They fear that if they order the number of aeroplanes absolutely necessary to have ready to meet an emergency they may, if the Mexican campaign should end before June 30th, when the regular appropriation will be made available, be criticised for spending the appropriation on machines available at present, which are

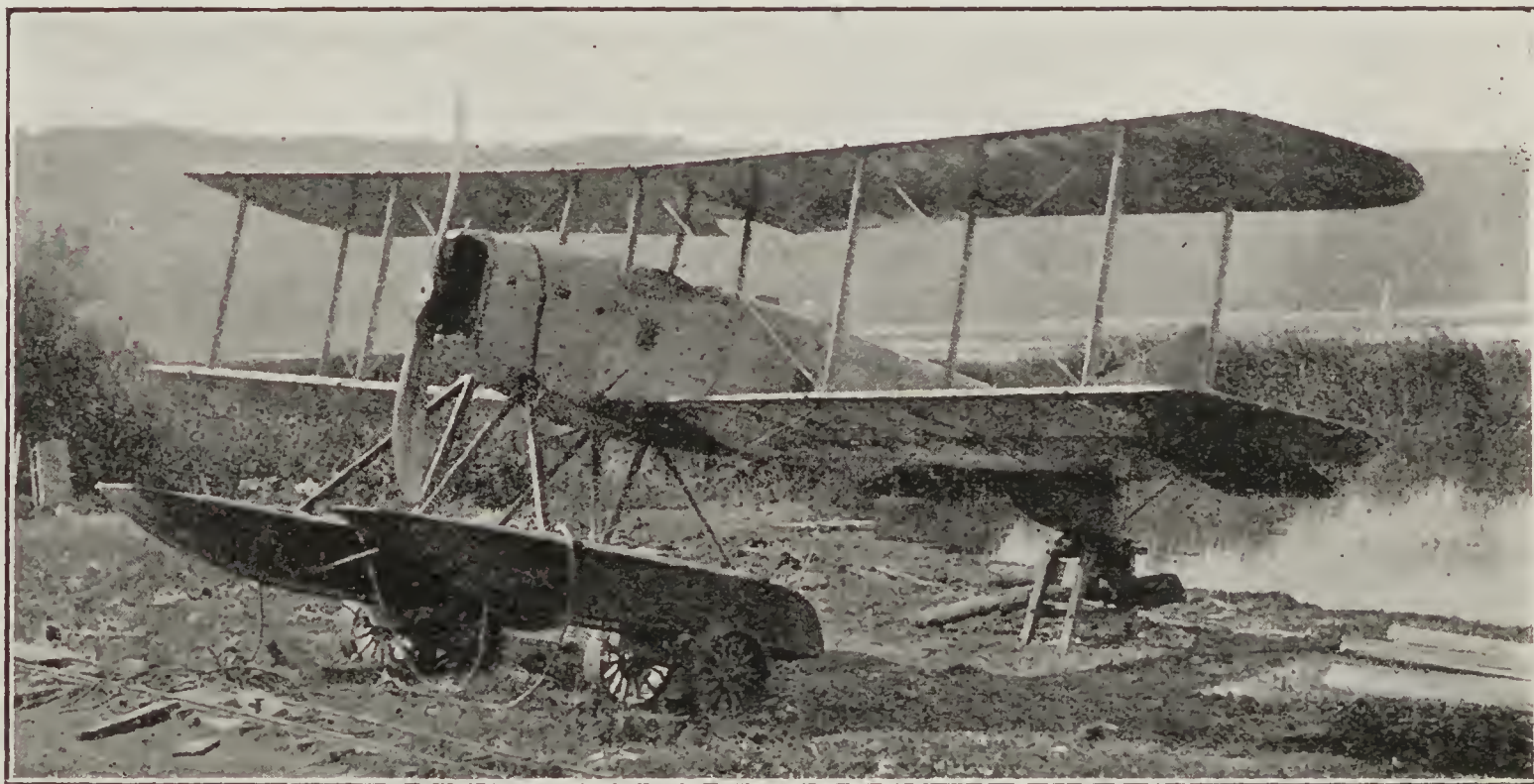
100-HOUR TEST OF CURTISS MOTOR

A Model "VX" Curtiss motor, rated at 160 h.p., has just completed a 100-hour test under the observation of official inspectors. The motor was first given five consecutive non-stop runs of 10 hours each, after which it was disassembled for inspection. On re-assembly, a 50-hour non-stop run was successfully conducted. The horse-power developed was always more than 160. This is the same motor used by Victor Carlstrom when he flew from Toronto, Ontario, to New York City last November.

BURGESS ACTIVITY

The opening of real spring weather has greatly stimulated activity at the Burgess Company School at Marblehead, and seaplanes of four different types are now in daily operation. Two pupils, who have been each supplied with new Burgess-Dunne aeroplanes, have resumed the work which was interrupted by the severe winter, and each is nearly ready to take out his certificate. These pupils are Godfrey and Norman Cabot, who, together with George R. Fearing, will give their services and those of their machines to the Massachusetts Naval Reserve in an effort to put the Militia of the State in first rank in the country so far as aviation is concerned.

Applications for tuition are coming in so rapidly that they



THOMAS SEAPLANE

suitable for the Mexican campaign, instead of waiting to secure a better type of aeroplane that may be developed in the meantime.

"On the other hand, they know that if they do not order the aeroplanes and the worst happens in Mexico they will be condemned most severely for not providing to the limit of the means at their disposal.

"The Aero Club of America believes that the American public would sooner spend a hundred times the amount involved than to deprive the Mexican expedition of the effective and protective aeroplanes. It is willing, in fact, if necessary, to invite public subscriptions to a fund to pay for these aeroplanes, same as it did in connection with the training of Militia officers and civilian aviators, to organise a reserve of trained aviators to have ready to meet an emergency. But it does not consider that necessary, believing that the public will not criticise the authorities for ordering twenty-four aeroplanes immediately, instead of waiting until the eight aeroplanes ordered have been put out of commission."

J. E. SLOANE'S NEW OFFER

To enable the Militia of ten different States which are anxious to form aviation sections to give a course in aviation to one of their officers, John E. Sloane, President of the Sloane Manufacturing Company, of Plainfield, N.J., and son-in-law of Thomas A. Edison, has offered to train an officer from the Militia of each of ten States free of charge.

Mr. Sloane, who has been interested in aeronautics for a number of years, is arranging to open a large, well-equipped aviation school at the Sheepshead Bay Speedway, in addition to his present school at Garden City. Students will be first taught on the slow military machine and then on the Sloane military biplane, which recently climbed 3,000 ft. in 7 minutes and 27 seconds, and made a speed of over 84 miles an hour.

cannot be accommodated immediately, and the school promises to run at capacity up to the time when winter conditions will once more put an end to the work. One of the chief reasons for the large increase is due to the popularity of the Dunne type among men who desire to fly for the sake of pleasure and recreation. Not only is the mastery of the controls much more simple than that of any other system, but the aviator is virtually prevented by the inherent stability of his craft from placing himself in a position from which extrication is even difficult.

Other types now flying at Marblehead include a Burgess-Dunne warplane, which has been equipped with a Curtiss XV motor of 160 h.p. This craft is even faster than the 140 h.p. Navy Burgess-Dunne, which showed an air speed of 80 miles an hour. Unofficial trials of the new craft show a velocity of close to 90 miles, by far the swiftest of any aeroplane ever used in marine flying. Moulds for the new boats under construction by the Burgess Company for the Curtiss Aeroplane and Motor Company of Buffalo have been set up, and give an idea of the enormous size of the aeroplane for which they were designed. The length of the boat is more than 50 ft., and it is constructed to lift a total weight of between 10 and 15 tons.

Considerable activity is on the programme for the Burgess School at Marblehead as soon as spring really arrives, and at least a dozen pupils will probably be at work by May 1. In addition to Godfrey L. Cabot and his brother Norman, Geo. R. Fearing, and half a dozen Harvard men who are planning an aviation corps at that institution, three others from Boston or vicinity have enrolled. They are Ector Orr Munn and Richard Mortimer, of Boston, and Robert Knowles, of Cambridge.

WRIGHT-CURTISS SUIT—The Wright-Curtiss patent litigation is still in progress. Action is expected before Judge Hazel at Buffalo, on May 22nd, 1916. The Wright Company has established new quarters at 60, Broadway, New York.

RANDOM REMARKS

XLVIII.—BRUTE STRENGTH By ARTHUR LAWRENCE

BEHIND the ways and means of this war there lies the wide-eyed query of those who are still young and may, therefore, survive the present occurrence, as to what we have meant by teaching them to turn the other cheek to the smiter. I can think of no answer to it, except that all that leads to war is a blunder; it is not much else in itself, that the over-



rated Napoleon had a temporary success from the point of view of cold-blooded assassins, and that he achieved nothing whatever in comparison with Shakespeare and Cervantes. It never occurred to me that the valour of my countrymen needed proof, yet well-paid Patriarchs of the Church fall back on that to excuse the well-deserved failure of their exposition of

the world's greatest gentleman. If it be good for us to slay one another, I say unto thee lay to it with a will.

Yet the topsy-turvydom of the general effect comes upon one at times. Everywhere the man of brains is discounted. If he cannot contrive a superior explosive, something more deadly than anything known, what can be the use of his brains? Let us find the man whose muscles are well developed, and worship him to our own degradation. He is a smiter, and only destructive forces are of any use at the moment. With the uninteresting lunacy with which mankind is sometimes affected we can still shudder at the horrors of the French Revolution and shut our eyes to the fact that, in these Christian days, we are most interested in the fellows who can cut up men into joints of raw flesh. I don't understand my Government being so mealy-mouthed in the matter. Either the whole thing is wrong, the outcome of muddling politicians who call themselves diplomats, without reason, or it is something which should be taken on to the limit. My words shall be clean, but, if the spirit moves me to swear, I will try to outdo the biggest curser that has not been stricken by lightning. No half measures for me.

On the doctrine of the survival of the fittest it is not the muscular who have survived. That is true, to some extent, of cat and dog life, but not of the human. In the primitive days, as it is now and will be for ever, it was the brainy chap who survived. If he was drawn into the combat he had some new dodge—a long club or a sling which laid low the merely muscular fellow. We have the historic instance of David and Goliath. The little fellow had thought it out. He didn't worry about measuring arms or whether both pistols were loaded. He thought out the sling and said nothing about it. There is something more than any giant-killing legend in that. It was

the poet—as ever—who came out on top. Sometimes the mere artist has hired prize-fighters to punch one another for his amusement. But he has invariably gone off with the best girl. Most often he has gone off with the money. Brute strength is necessary for the heaving of coal. It is necessary, also, in the high art of war, an art which demands letting loose the largest amount of explosives followed by knife slashing and clubbing arrangements. But there are a few with tongue in cheek. They will inherit the earth.

It is from the songster and the painter that the larger part of the future race will descend. Am I reflecting in any way on the brave fellows, even those of my own flesh who are resisting the lustful tyranny of a race which hopes that brute strength will triumph? God forbid. But occasionally there is the swaggering gait of men of a type (of all nationalities, although least of our own) who have never grasped the bald simple fact that men who rely only on physical strength are always the hewers of wood and drawers of water, and have always been the servants of those who possess something better. It is easy for them to get things out of focus, for they are of slightly increased importance during a war. It is well for intelligence that no war lasts for ever.

Yet there is no small advantage to the individual in the consciousness of physical strength. I knew a man who had been acting as manager to one of the best of our publishers. He told me that any intellectual attainments to which he could lay claim counted as nothing with him in comparison with the fact that he could deliver a punch which would knock any biped up to fourteen stone off its legs. "I have never used it," he told me, "and I don't suppose I ever shall, but I am always happy in the peaceful reflection that such a punch is mine own." Of another man whom Nature had created for the fisticuff art, I enquired if he had ever thumped anyone in his life.

He replied that he had not, and hoped he never would. "It's not that I don't want to sometimes," he said, "but I am an unlucky fellow. If I knocked a man down it's long odds that his ugly head would strike the corner of a fender or something, and I should be had up for manslaughter." This superstition struck me as rather pretty, but I forbore to take what the vulgar refer

to as "liberties" with him. Men of great strength are chary of using it. The man who has been through the ring, not of the better type, will turn his face to the smiter and put up with a lot of it with a grim smile.



STATEMENTS IN PARLIAMENT

HOUSE OF COMMONS

May 8—*Lord Curzon and the Air Service*—Mr. Hogge asked the Under-Secretary of State for War whether he would say what were Lord Curzon's recommendations for the Air Service.

Mr. Tennant (L., Berwickshire): This question is now under the consideration of the Government. It would be premature to make a statement.

Answering Mr. Lynch, Mr. Tennant said that in view of the advisability of developing to the fullest extent the air-power of the nation, he would take advantage of the services that various private aircraft factories, as, for instance, the Whitehead aircraft factory, were in a position to render, and stimulate their efforts by suitable orders.

British Zeppelins?—Replying to Mr. Hogge, who asked how many Zeppelins we possessed, Dr. Macnamara (L., Camberwell, N.) said: It is not considered in the public interest to give the information desired.

The Air Service Inquiry—Mr. Tennant, replying to Mr. Hogge (L., Edinburgh, E.), said the names of the Committee appointed to inquire into the administration and command of the Royal Flying Corps were as follows:—Mr. Justice Bailhache (chairman), Mr. J. G. Butcher, K.C., M.P., Mr. E. Shortt, M.P., Mr. J. H. Balfour Browne, K.C., the Hon. Sir Charles Parsons, K.C.B., Mr. Charles Bright, K.C., with Mr. D. Cotes-Predy as secretary. It was also proposed to invite a military officer of high rank to join the Committee. He believed the Committee would meet to-morrow (Tuesday).

May 9—*The Air Debate*—Mr. Billing asked whether, seeing the Compulsion Bill was now actually settled, the Prime Minister would at once name a day for the promised air debate. Would he set aside next Monday for that purpose?

Mr. Asquith said that as soon as the Military Service Bill was through he would give early facilities for the debate.

Mr. Billing asked whether it was not advisable that an aeronautical expert should be appointed on the Committee charged with investigation.

Mr. Asquith replied that two members of the Committee were civil engineers of eminence.

Mr. Billing wished to know whether these engineers were acquainted in any degree with the requirements of flying machines or knew whether the machines chosen for this country were fit to meet those of the enemy.

Mr. Asquith: There is no man in this country who excels Sir C. Parsons in knowledge of these matters.

May 10—*British Aeroplanes at Kut*—Mr. Joynson-Hicks (U., Brentford) called attention to the German reports as to the shooting down by the Turks of old British aeroplanes endeavouring to get food into Kut, and asked whether these aeroplanes were some which did reconnaissance work in the Sinai district, but were so bad that they were transferred from there to Mesopotamia more than a month ago.

Mr. Tennant said that a recent Turkish *communiqué* stated that the dropping of food by aeroplanes at Kut had ceased. The General Officer Commanding in Mesopotamia reported that between April 11 and 29 British aeroplanes of the Royal Flying Corps and the Royal Naval Air Service had dropped at Kut 18,000 lbs. of food, besides quantities of medicines, stores, and materials. No aeroplanes in Egypt or the Sinai district were sent to Mesopotamia, though some of the *personnel* were. During these operations there were numerous aerial combats, in one of which a British seaplane was driven down into the enemy's lines, the observer being killed and the pilot wounded. In another case the pilot was wounded, but succeeded in landing safely behind the British lines. These were the only casualties during the operations. The House would see that the reports to which attention had been drawn were characteristic German reports.

Mr. Joynson-Hicks: In view of these "characteristic German

reports," would it not be for the benefit of the entire nation if the right hon. gentleman would make on occasion some such satisfactory statement as he has just made?

Mr. Tennant: I will take the suggestion into consideration.

May 11—*Projectiles Against Zeppelins*—Mr. King (L., Somerset, N.) asked the Minister of Munitions whether he would offer a prize of £10,000 to the inventor of a chemico-explosive incendiary bullet small enough to be fired from a gun mounted on an aeroplane and having the property of exploding within the envelope of a Zeppelin and setting fire to it.

Dr. Addison (L., Moxton): The question of perfecting the types of projectile suitable for use against Zeppelins, whether from aeroplanes or otherwise, is constantly before the Ministry of Munitions, and they have been assisted by many suggestions from inventors. There does not appear to be any occasion for offering the particular incentive suggested. We have received tens of thousands of suggestions.

The Air Services Inquiry—Mr. Asquith, asked by Mr. Billing which members of the judicial committee on the Air Services were possessed of technical knowledge of aeronautics, and whether he would appoint to that committee a sufficient number of men of aeronautical experience as would give public confidence in the findings of the committee, simply referred the hon. member to the answer he gave on May 9, to which he had nothing to add.

Mr. Billing: Will the right hon. gentleman say whether it is his intention or not to have aeronautical experts to consider into what is a purely aeronautical matter?

Mr. Asquith: No, sir. I have nothing to add.

Mr. Asquith, in answer to a further question by Mr. Billing as to why, in view of the fact that the criticisms and allegations applied equally to the Royal Naval Air Service and the Royal Flying Corps, the terms of reference of the judicial committee were limited to the Royal Flying Corps, said: I have read the speech of my right hon. friend, in which he promised to ask for a judicial inquiry. It is clear that this inquiry was to be made into the relation between the casualties in the Royal Flying Corps and the character of the machines with which the Army pilots had been provided. The charges of murder were made against the Army, not the Navy. In any case, after consulting the First Lord of the Admiralty, I do not propose to extend the scope of the judicial investigation.

Engines for Aircraft—Mr. Billing asked the Under-Secretary for War whether the Royal Aircraft Factory had placed orders for 2,500 engines of their own design; whether, since first placing the orders, over 500 alterations in the drawings had been issued to the manufacturers; whether this design was based upon the successful Renault engine; whether the alterations or alleged improvements had resulted in a wholly inefficient engine; whether the order for 2,500 of these engines was placed before the engine had been proved efficient; whether this large order had deprived other constructors of necessary material; whether, owing to unskilful design, the engine was peculiarly liable to catch fire in the air and so jeopardize the life of the pilot; whether the Aircraft Inspection Department of the Royal Flying Corps had protested against the employment of this engine; and, if not, whether he would call for a report on the subject, and, if that report confirmed the allegations in this question would the War Office give orders to stop the construction.

Mr. Tennant: The Royal Aircraft Factory does not place orders for engines. There are three different types of engines which have been designed at the Royal Aircraft Factory, and orders for these have been placed by the Directorate of Military Aeronautics. One of these resembles the Renault engine. During the development of these engines many alterations were made in drawings and specifications. Material available for engines must, of course, be shared between different constructors. The remaining allegations in the question are devoid of foundation.

AIRCRAFT IN ACTION

OFFICIAL INFORMATION

ENGLAND

May 1—*Rumoured Raid on Sylt*—The *Ribe Stiftstidende* publishes a report that British aviators attacked the German fortifications on the island of Sylt on the night of Easter Sunday (April 23). The fact that a German aeroplane was brought into Tondern, completely demolished, on Easter Monday morning (April 24) lends colour to the rumour. Since the British attack of March 25 the Germans have been exceedingly active round Tondern. The garrison has been considerably strengthened at Tondern and Sylt, and anti-aircraft guns, artillery, and wireless have been set up at Scherrebek, Ballum, and Tondern.

May 4—*British Aviator in Holland*—A British aeroplane had an exciting experience to-day (May 4). Pursued by enemy craft, the

aviator landed in Belgium, but succeeded in ascending and escaping to Holland, where he made a descent near Sluis.

FRANCE

April 28—*Fatal Aeroplane Accident*—Early this morning a military biplane while flying over Saint-Denis, north of Paris, caught fire and crashed to the ground, both occupants being killed.

May 3—*Aviator's Two Fokkers*—Lieutenant de G—, a French aviator, on Tuesday (May 2) brought down two Fokkers within a few minutes. His first victim fell in the French lines, the pilot being shot dead by machine-gun fire. The second combat took place in full view of the French lines. The enemy machine at last fell from an immense height, turning over and over, and the French pilot then landed unhurt.

May 8—Two German Aeroplanes Brought Down—Two German aeroplanes were brought down in an air fight in the Verdun district. One of them fell in the vicinity of Ornes, and the other, which had been seriously hit, was compelled to come to earth south of Azannes.

May 11—Shells on Railway Stations—During the night of May 10-11 four of our bombarding aeroplanes dropped 26 shells on the railway stations of Damvillers and Etain, and on a park near Foameix, where a fire broke out.

May 13—Bombs on Airship Sheds—During the night of May 12-13 one of our squadrons, consisting of ten aeroplanes, dropped 43 shells on the stations of Nantillois and Brioules and on bivouacs in the regions of Montfaucon and Romagne [all in the Verdun region]. During the same night one of our aeroplanes dropped 11 shells on the airship sheds of Metz-Frescaty.

RUSSIA

May 8—Bombs on Village—Two German aeroplanes dropped eight bombs on the village of Liakhovitchi.

May 10—Enemy Aeroplane Brought Down—Near Chartoryisk we brought down an enemy aeroplane and made prisoners the observer and the aviator.

May 11—German Captive Balloon Breaks Loose—In the region of the Middle Strypa, east of Podgatie, a German captive balloon broke from its moorings and fell behind our lines near Husiatin.

ITALY

May 8—Bombs over the Adige Valley—A strong flotilla of our aeroplanes yesterday (May 7) made a raid over the Valley of the Adige and dropped numerous bombs on Mattarello and Calliano, both concentration centres of enemy troops. All our aeroplanes returned without damage. An enemy air squadron flew over the valley of the Lower Isonzo and dropped bombs without causing any casualties or damage.

May 11—Railway Station Bombarded—An enemy aeroplane dropped bombs near the railway station of Ospedaletto (Sugana Valley), killing several horses. Our aeroplanes bombarded the railway station of San Pietro di Gorizia and the environs of Aisovizza.

May 13—Enemy Aircraft Driven Off—Enemy aviators flew over the Lower Isonzo, but were driven off by ours, the latter dropping some bombs on enemy camps and troops at Novavas and Rangiano.

EGYPT

May 9—Raid on Port Said—War Office announcement: The General Officer Commanding in Egypt reports that two hostile aeroplanes attacked Port Said at 7.30 a.m. on May 7, but were quickly driven off by our anti-aircraft guns. Eight or nine bombs were dropped, wounding three of the civilian population, but causing no damage.

May 9—Machine Forced to Descend—War Office announcement: On May 7 an aerial combat took place, one of our machines being engaged with a hostile monoplane. Our machine was forced to descend, owing to a perforated petrol tank, but succeeded in reaching our lines; both pilot and observer were unhurt.

May 9—Three Aeroplanes Captured—Turkish official: In the list of booty claimed by the Turks as having been taken at Kut, they state that "three aeroplanes" were included in the list.

MESOPOTAMIA

May 10—The Air Services in Mesopotamia—The following references to the work of the Air Services in Mesopotamia occur in General Sir John Nixon's despatch on the operations in Mesopotamia in October, November and December, 1915. The despatch is dated January 17, 1916:—During General Townshend's concentration at Aziziyah accurate information had been obtained by aerial observation regarding the position of the Turkish defences. The officers employed on these reconnaissances displayed the same intrepidity and devotion to duty that has been commented on in previous despatches. Unfortunately during the actual period of the battle at Ctesiphon a series of accidents deprived the Royal Flying Corps of several officers and machines. Among those forced to descend within the enemy's lines was Major H. L. Reilly, a Flight Commander of exceptional ability, who has much distinguished service to his credit.—On November 25 the remainder of the wounded were sent back to Lajj. Up to this time it appeared from hostile movements to their rear—reported by air reconnaissance—that the Turks contemplated a retirement from their remaining positions. But apparently they received fresh reinforcements on the 25th.

May 12—British Aviator Brought Down—Turkish official: A hostile aeroplane was hit by our guns and came to earth on fire behind the enemy's trenches.

EAST AFRICA

May 9—Aeroplane Missing—An aeroplane despatched to reconnoitre the line of the Usambara Railway (in German East Africa, not far from the northern frontier) has failed to return.

MEDITERRANEAN

May 8—Air Raids in the Ægean and Red Sea—Turkish official: On Saturday (May 6) two enemy aeroplanes threw 10 bombs on a ship cruising near Akaba and slightly injured one soldier. Off the island of Imbros a monitor and a cruiser, supported by the observations of aeroplanes, threw 40 shells in the neighbourhood of Sedd-ul-Bahr without effect. One of our aeroplanes hit the enemy cruiser with two bombs, and the vessel, wrapped in smoke, took to the open sea. In

the vicinity of the coast islands a monitor, a torpedo-boat, and two enemy aeroplanes opened fire against some coast points, but were obliged by the reply of our artillery to cease fire. The monitor and torpedo-boat were both hit.

BALKANS.

May 14—Allied Aviators Driven Off—German official: Allied aviators dropped bombs on Mirovtsa and Doiran, but were driven off by anti-aircraft guns.

GERMANY

May 8—Two French Biplanes Brought Down—Two French biplanes fell to the ground in a burning condition over the Froideterre Hill (east of the Meuse) (in the French lines near Verdun).

May 10—Factories Bombarded—German aviators heavily bombarded factories at Dombasle (about four miles west of Verdun) and Raon l'Etape (north of St. Dié).

May 11—Bombs on Dunkirk—German aeroplanes bombarded Dunkirk and the railway precincts near Adinkerke.

May 12—Bombs on Railway—A German aeroplane squadron lavishly bombed the railway station of Horodieja, on the Krashin-Minsk line.

May 13—Two Enemy Machines Brought Down—A German battle aviator shot down an enemy biplane over the Bourguignon Wood, south-west of Laon. A British aeroplane was brought down on Thursday (May 11) by our anti-aircraft fire south-east of Armentières.

FROM OTHER SOURCES

BALKANS

May 10—Bombs on Greek Town—It is reported from Janitza, an exclusively Greek town, and one not occupied by the Allies, that a German aeroplane yesterday (May 9) dropped bombs, one falling near a detachment of Greek soldiers. There were no victims. General Sarraïl denies the report of an Athens pro-German journal that a French aeroplane flying in the Doiran district was brought down at Guida by German guns.

May 11—Bombs on Smyrna—Reports from Athens state that a squadron of Allied aeroplanes from Mitylene has raided the environs of Smyrna.

May 14—Bombs on Bulgar Depots—I learn that French aeroplanes this morning (May 14) attacked Bulgar-German camp depots at Xanthi, dropping 400 bombs. All returned safely to Salonika. No details are to hand.

(Xanthi is in Bulgaria, about ten miles from the coast of the Ægean and 40 miles north-west of Dedeagatch.)

MESOPOTAMIA

May 3—Stores by Aeroplanes—The following details of the stores supplied to General Townsend at Kut by aeroplane have now been published. The large quantity of grain discovered on January 24 could not be utilised at once owing to the difficulty of grinding for so large a garrison, but mill-stones were dropped by aeroplanes and the engine was fed with oil stored in the naval barges.

During the last phase, while the relieving force was being held up on the narrow flooded front at Sanna-i-yat, stores were dropped into Kut by aeroplane, chiefly salt, atta, flour and tea. Previously aeroplanes had been employed for dropping light articles into the camp, such as rifle-cleaners, spare parts for wireless, siege nets for fishing, and at one time cigarettes and tobacco; but as it was impossible to supply all, General Townsend ruled out these luxuries as introducing a form of privilege. He himself shared every privation with his troops.

HOLLAND

May 8—Balloon Drifting Over Holland—According to an Amsterdam newspaper, a disabled balloon was seen on Sunday (May 7) drifting over Havelte, in Holland, from south to north. Half of the balloon was still filled with gas, while the remainder hung down limply.

GERMANY

May 9—Zeppelin Losses—The news of the destruction of a Zeppelin off the Schleswig coast by British gun fire was evidently suppressed upon its arrival in Germany, for the *Cologne Gazette* by some inadvertence printed the later announcement that the British ships concerned were the Galatea and the Phaeton, but appended this announcement to a telegram about the destruction of a Zeppelin at Salonika! The loss of these two Zeppelins is particularly unfortunate for German journalism, because the papers on Friday and Saturday (May 5 and 6) explained with great care that the loss of L20 off the coast of Norway was due to the weather and that such unfortunate "accidents" are in sharp contrast with the proved immunity of Zeppelins to enemy attacks. The Naval Press Bureau had, indeed, supplied the Press with a long article about the loss of L20, which expressed special joy at the fact that the airship succumbed "not to the enemy's fire, but to the strong south winds." The public was assured that the loss was "quite insignificant" in view of the "important successes" achieved by the squadron to which L20 belonged.

May 9—Aeroplane Factory Destroyed—The *Kolding Avis* learns that a few days ago a fire broke out in a large aeroplane factory at Altona (west of Hamburg) through the explosion of the tank of an aeroplane which a mechanic was filling with petrol. Sixty-two other aeroplanes, some of which were completed and others in a half-finished state, were destroyed, together with the factory. The 400 workmen employed escaped without injury.

May 13—Aeroplane Brought Down—I learn from the frontier that near Dixnude a German aeroplane fell into the lines, having been hit by Belgian artillery after a raid over Dunkirk. The pilot was killed, the observer severely wounded, and the aeroplane destroyed.

FURTHER ZEPPELIN CASUALTIES

Soon after the news of the destruction of *L 20*, in rapid succession came the report of the destruction of two further Zeppelins, the first by the guns of a light British cruiser squadron off the coast of Schleswig on May 4, the destruction being completed by an English submarine, which rescued a portion of the crew, and the second the wrecking of another Zeppelin (as first conjectured, though even now the possibility of the craft having belonged to the "17" class is not excluded) by naval guns in the vicinity of Salonika during the following night. Regarding the latter incident, the following clearly well-informed message from *The Times* correspondent is of interest:—

"Salonika, May 7.

"French cavalry arrested the crew of the stranded Zeppelin. The commander was a Zeppelin pilot before the war. He says he has taken part in raids on the English coast, and also commanded the Zeppelin which destroyed the station at Vilna. This was his first journey to Salonika. His object was to bomb the fleet, and especially newly-erected installations. He states that the Zeppelin had been flying 34 hours.

"If you can imagine the wreck of a gigantic winter garden lying in the heart of a desolate swamp of reeds, water, and mud, you have some idea of what the Zeppelin looks like which sailed so proudly over Salonika in the small hours of this morning.

"The framework had been stripped bare by the flames from her own petrol tanks, and the tangled mass of aluminium girders looks so like the ruins of an East Coast pier pavilion hit by a Zeppelin bomb that there is double satisfaction in the realisation that, thanks to the guns of the British Fleet, this scrap heap is all that remains of one of Germany's most recent airships.

"You have to go in a motor-boat to reach the place where she fell.

"Half a mile inland the naked bones of the Zeppelin writhe across the swamp like the ruins of a big switchback, but to reach them you have to force a way through dense rushes standing far above one's head, walking up to the knees in black oozy water, and wading waist-high in the channels down which the river trickles to the sea.

"Into the heart of this morass fell the Zeppelin. Only just in time did the crew fling over their stock of bombs, which they had not yet begun to use. You can see the holes made by the explosions where they fell, the last being within a few hundred yards of where the airship grounded. She stood with sufficient force to crumple up the frail framework, and the crew, to save themselves from being caught in the splintering cabin, dropped out at the last moment. They must have floundered about in the quagmire for ten minutes, collecting their great coats and whatever else they could carry. Then they opened up the petrol tanks and set the whole wreck afire. The blaze of the flaring gas and oil made the swamp bright as day.

"The crew crashed off through the reeds, but it was hopeless to think of staying in the marsh, and when day came they waded out on to drier ground inland, where they were not long before four officers and eight men fell prisoners to a patrol of French cavalry out searching for them."

VISIT TO THE WRECKED AIRSHIP

Telegraphing on May 6, Mr. Ward Price states:—

"The twelve men of the Zeppelin crew, captured by the French as they came out of the shelter of the thick reeds of the marshes, stated that the Zeppelin came from Temesvar, in Hungary. This would be a very long journey, especially over so many mountain ranges, and till lately at least they had one at Sofia, much nearer. It would be natural that the crew should attempt to conceal their point of departure.

"Directly they got over Salonika the searchlights that picked them up were of such unusual power, especially one of those of the Fleet, that they were dazzled and unable to pick up their bearings. At the same time shells began to burst all around them from all sides, and, according to their statement to the French, they were hit several times, one ballonnet being burst, and one of the four motors hit and stopped.

"It seems certain, however, that it was a shell from an anti-aircraft 12-pounder on the fore-bridge of a British battleship lying in the Gulf that actually brought her down. A shell was clearly seen to strike her, and from that moment she drifted gradually down on to the marshes, the fall taking over a quarter of an hour.

"The prisoners are lodged in a building that was formerly the German school at Salonika.

"Paying a second visit to-day to the wreck of the airship, I noticed written in pencil on the aluminium boss that forms the prow of the ship and links up all the girders of the frame an

address scrawled in pencil in German characters. It read 'Potsdam,' then the name of a street, and a number, illegible; then the date 'August 13, 1915.' This may possibly be the date on which the airship framework was finished. It is, at any rate, an indication of the approximate period of her construction.

"The gaunt skeleton rears itself up 50 ft. above the marsh and is a most conspicuous landmark for vessels entering the Gulf. All around the framework are semi-circular brackets, in which bombs were carried, and we found one weighing 150 lbs. still in position to-day.

"Comparing this wreck with that of the Zeppelin in which I happened to be making a trip six years ago when she smashed up in the Teutoberger Wald, I was not struck by any difference as to size or arrangement such as would be apparent to an inexperienced eye. This ship is perhaps longer than the *Deutschland* was. She seems to have been nearly 600 ft. in length. The size of the engine, gondolas, and propellers appears to be the same. The latter are of polished walnut wood, built in layers, and edged with copper. They are marked 'Lorenzen Propeller Partrax Original.'"

[Various other names are given by other correspondents, but this is probably the correct version, which will not be unfamiliar to English readers.—ED.]

OFFICIAL DETAILS

The following facts with regard to the Zeppelin which was brought down are derived from official sources:—

The vessel was No. Z 85 (*LZ 85?*), and was built at the latter end of 1915. Her length was 170 metres (560 ft.), and she had four engines, each of 100 h.p. Her speed was 95 kilometres (60 miles) an hour. The tanks held 2,500 litres of petrol. She was recently engaged in bombing Riga, Minsk, and Dvinsk, and attempted at the end of February and in the middle of March to approach Salonika, but was driven off near the frontier.

The Zeppelin was hit three times on Friday (May 5), once in the reservoir, once in a ballonnet, and once in the stern.

DESTRUCTION OF L7

The correspondent of the *Berlingske Tidende* at Esbjerg says that the destruction on Thursday (May 4) of the Zeppelin *L 7* by British cruisers was plainly seen from Horns Reef, off the west coast of Denmark. It was near this spot that the airship was observed to be hit. Flames were noticed and the airship was driven eastward by the wind off Blaavandshuk, whence it was seen to drop in the water and rapidly disappear beneath the surface.

Copenhagen, May 14—The Bergen correspondents of the *Verdens Gang* and *Morgenblad* state that at 5 o'clock on Friday morning (May 12) three miles west of Heir (?), a great airship was reported going south-west. She changed her course, going northward. Later some ships, probably torpedo-boats, were sighted, steaming at full speed in the same direction. The airship made some strange turns over a fishing vessel which was near. She then seemed to descend obliquely towards the level of the sea but disappeared in a bank of fog. On Thursday afternoon (May 11) a large French fleet had crossed west of Vags Island. It is presumed that some of these ships fired upon the airship, which is believed to have been sunk.

Another report states:—At 5 o'clock yesterday morning (May 13) a Zeppelin was observed outside Feje on the west coast of Norway pursued by three British destroyers. Suddenly the airship began to sink, the crew being unable to control her movements. Finally the Zeppelin was seen 100 ft. above the surface of the water but disappeared in the fog. It is supposed she was shot down and lost. Yesterday afternoon (May 13) a large French flotilla was observed off the island of Vaag.

[The discrepancy in the dates should be noted. Feje is on the Norwegian coast, a few miles north of Bergen. Reports such as these should be received with caution until confirmed.—ED.]

CASUALTIES

ROYAL NAVAL AIR SERVICE

PREVIOUSLY REPORTED AS MISSING ON DECEMBER 20, 1915, NOW UNOFFICIALLY REPORTED TO HAVE BEEN KILLED ON THAT DAY
Besson, Flight Sub-Lieut. Frank, R.N.

SLIGHTLY WOUNDED, REMAINED ON DUTY

April 29
Lunt, Second Lieut. Edward C., R.M., R.M.A., Anti-Aircraft Brigade.

MISSING

Terraneau, Flight Sub-Lieut. Cecil R., R.N.

MISSING, UNOFFICIALLY REPORTED PRISONERS

May 6
Cowley, Flight Sub-Lieut. Arthur T. N., R.N.
Inge, Sub-Lieut. Ronald M., R.N.V.R.

ACCIDENTALLY INJURED

May 8

Pulford, Flight Lieut. Conway W. H., R.N. (Lieut., R.N.).

ROYAL FLYING CORPS

KILLED

Undated

Ryckman, Second Lieut. E. G., R.F.C.

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED

Garlick, Lieut. F. A., R.F.C.

Knox, Capt. W., Cameron Highlanders and R.F.C.

DIED OF WOUNDS

Atwell, 7194 2nd Class Air Mech. G. F., R.F.C.

Adie, Second Lieut. H. M. E., R.F.C.

DIED

Briscoe, 2nd Class Air Mech. F. H., R.F.C.

WOUNDED

Creery, Second Lieut. C. J., R.F.C.

Mercer, Second Lieut. G. H. J., Duke of Cornwall's Light Infantry, attached R.F.C.

Dickie, Lieut. G. P., Black Watch and R.F.C.

Tolhurst, Second Lieut. W. H., R.F.C.

Van Goethem, Capt. H. E., R.F.C.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER

Lerwill, Lieut. O., R.F.C.

PREVIOUSLY MISSING, NOW REPORTED DIED AS PRISONER

Cox, 2373 1st Class Air Mech. W. H., R.F.C.

Undated

MISSING

Bruno, Capt. C., R.F.C.

PRISONER

Hill, Lieut. C. W., R.F.C.

UNOFFICIALLY REPORTED KILLED

May 4

Dennistoun, Lieut. J. R., R.F.C.

Lieut. John R. Dennistoun, R.F.C., was killed on May 4 in an air fight, falling behind the enemy lines. With his father, Lieut.-Col. R. M. Dennistoun, K.C., and his brother, Capt. James A. Dennistoun, he came to England with the first Canadian contingent as an officer of the Fort Garry Horse of Winnipeg. He transferred to the Royal Flying Corps in January, 1916, having served nearly a year with the 1st Canadian Division at the front. He was educated at Trinity College School, Ontario, and Trinity College, Cambridge. He was mentioned by Lord French for gallant and distinguished conduct in the field between April 22-25, 1915, when the Canadians were at Ypres.

May 10

White, Lieut. C. D., King's Royal Rifle Corps, attached R.F.C.

The following notice appeared in the obituary columns of May 15:—

WHITE—On the 10th inst., Charles Douglas White, Lieut., King's Royal Rifle Corps, Military Cross, attached Royal Flying Corps, son of the late John White, Indian Civil Service, and the late Helen Elise White.

WEEK-END FATALITIES

Lieut. O. H. Hake, pilot, and Mr. F. G. Sumner, passenger, were killed in an aeroplane accident on May 14 near Norwich. The machine was seen to be in difficulties, and in its descent crashed into a fir tree. The tree was cut in two, but the aircraft kept on until it dashed against a wall, when it was completely wrecked. The pilot and passenger were found dead.

APPOINTMENTS

ROYAL NAVAL AIR SERVICE

F. H. Hodges granted a temp. commission as Lieut., R.N.V.R., with seniority of May 6.

E. P. Smyth granted a temp. commission as Lieut., R.N.V.R., and appointed to the *President*, additional, for R.N.A.S., to date May 5.

Flight Sub-Lieut. M. A. Simpson promoted to Flight Lieut., and Temp. Flight Sub-Lieut. R. Y. Bush promoted to Temp. Flight Lieut., both with seniority of April 1.

Engineer Lieut. Frederick J. Baker to be Engineer Lieut.-Commander: April 28.

The undermentioned have been entered as Probationary Flight Sub-Lieuts. for temp. service, and appointed to the "*President*," additional, for R.N.A.S., to date as mentioned:

D. D. Findlay: March 28.

G. B. Anderson: March 29.

F. P. L. Washington: April 7.

A. G. Maodonald: April 11.

W. E. Flett: April 13.

W. L. Anderson: May 10.

J. R. Blunt: May 11.

J. K. Fryer-Smith, T. P. M. Alexander, A. R. Greenwell,

K. H. Milward, W. G. Kendrick, C. B. Wincott, J. E.

Scott, J. E. Ruthven, W. K. Rae, L. H. Rochford, E. G. Selons-Hodges, and R. V. Weeks: May 15.

Probationary Flight Sub-Lieuts. confirmed in rank:

Christopher J. Galpin: March 30, 1915.

Harold A. Bower: May 12, 1915.

Alfred F. E. Warner: May 25, 1915.

John A. Smith: October 10, 1915.

John D. Marvin: October 11, 1915.

Temp. Probationary Flight Sub-Lieuts. confirmed in rank:

Norman W. G. Blackburn: May 17, 1915.

Philip W. James: June 25, 1915.

Sidney G. Beare: July 22, 1915.

Thomas F. Le Mesurier: July 23, 1915.

Charles W. Greig, Augustine F. Marlowe, and Aidan A. Wallis: August 7, 1915.

Eric B. Thompson and Charles W. Scott: August 8, 1915.

Leonard G. Scott: August 14, 1915.

William H. S. Aplin: August 21, 1915.

Henry A. J. Wilson: August 27, 1915.

Bert S. Wemp: September 1, 1915.

Ronald Grahame: September 3, 1915.

William H. Hope: September 7, 1915.

Robert H. Horniman: September 16, 1915.

Rupert E. Darnton: September 17, 1915.

Herbert G. Hall: September 18, 1915.

Gerald M. Morse: September 20, 1915.

Frederick M. Fox: September 22, 1915.

Maurice R. Buckland: October 1, 1915.

Ernest E. Deans: October 2, 1915.

Adam B. Ovens: October 3, 1915.

George H. Simpson: October 6, 1915.

John C. Railton: October 9, 1915.

Louis M. B. Weil: October 11, 1915.

Carl D. Newman: October 15, 1915.

Gray C. C. Kilburn: October 17, 1915.

Alfred L. Thorne: October 19, 1915.

Philip S. Fisher: October 27, 1915.

Paul D. Robertson: October 30, 1915.

Charles E. Rich, Howard V. Terry, Frederick A. Best, and Gordon F. Ross: October 31, 1915.

Kenneth F. Saunders and John K. Waugh: November 3, 1915.

Edward G. O. Jackson, Bernard W. Helmsley, George W. Biles, and William Hocking: November 7, 1915.

Humphrey T. Jones: November 8, 1915.

George G. MacLennan: November 11, 1915.

George B. Taylor: November 14, 1915.

Walter J. Sussan: November 15, 1915.

Ernest J. Cuckney: November 17, 1915.

Arthur W. C. Kidner: November 22, 1915.

James D. Scott, Charles B. Sproatt, and Ronald F. Redpath: December 1, 1915.

Joseph Gorman: December 1, 1915.

George S. Gray and Melville G. Dover: December 6, 1915.

Thomas H. Newton: December 7, 1915.

William H. Mackenzie: December 11, 1915.

Herbert G. Travers: December 14, 1915.

Ralph H. Collett and James A. Glenn: December 16, 1915.

Basil D. Hobbs: December 27, 1915.

Edward S. Boynton, Frederick S. Mills, and Kenneth M. Smith: December 30, 1915.

John E. Northrop: January 14.

The following temp. commissions (R.N.V.R.) have been granted, with seniority of May 9, and all appointed to "*President*," for R.N.A.S.:

Lieuts. E. H. Fitchew, N. Vaux, S. Hedlev. and W. F. Vernon; Sub-Lieuts. N. V. Wrigley (late Flight Sub-Lieut.) J. G. Mallett, H. C. Willson, and V. F. Bartlett.

ROYAL FLYING CORPS

The following appointments are made:—

Central Flying School:

Major N. D. K. MacEwen, Argyll and Sutherland Highlanders, from a Wing Adjutant, to be Adjutant: April 1.

Wing Commander:

Capt. (Temp. Major) J. G. Hearson, D.S.O., R.E., from a Squadron Commander, and to be Temp. Lieut.-Col. while so employed: May 6.

Squadron Commanders:

Date of seniority of Major A. D. Carden, R.E., is May 20, 1912, and not as in *Gazette* of December 8.

Capt. F. G. Small, Connaught Rangers, from a Flight Commander, and to be Temp. Major whilst so employed: April 30.

Flight Commanders:

Capt. D. Rainsford-Hannay, 53rd Sikhs, Indian Army, from a Balloon Officer: April 20.

Capt. A. V. Holt, Royal Highlanders, from a Flying Officer: April 23.

Capt. R. L. S. Raffles, Royal Welsh Fusiliers, S.R., from a Balloon Officer: April 27.

Lieut. P. LeG. Gribble, Hampshire Yeomanry, T.F., from a Flying Officer, and to be Temp. Capt. whilst so employed: April 30.

Squadron Commanders, and to be Temp. Majors whilst so employed:

Second Lieut. (Temp. Capt.) R. A. Cooper, Hampshire Yeomanry, T.F., from a Flight Commander: April 19.

Capt. R. Loraine, S.R., from a Flight Commander: April 24.

Qmr. and Hon. Lieut. (Temp. Capt.) F. H. Kirby, V.C., from an Equipment Officer: April 26.

Capt. A. V. Bettington, S.R., from a Flight Commander: April 30.

Flight Commanders, from Flying Officers, and to be Temp. Capt. whilst so employed:

Lieut. E. W. Barrett, S.R.: March 29.

Second Lieut. A. J. Capel, Somerset Light Infantry: April 16.

Lieut. A. B. Adams, S.R.: April 20.

Lieut. C. W. Snook, S.R.: April 24.

Flight Commanders, from Balloon Officers, and to be Temp. Capt. whilst so employed:

Capt. A. L. Kent-Lemon, York and Lancaster Regt., and Second Lieut. J. S. D. Berrington, Lancashire Fusiliers, T.F.: April 1.

Flying Officers (Observers):

Temp. Second Lieut. C. C. Treatt, North Lancashire Regt.: October 21, 1915.

Second Lieut. L. J. Bayly, R.A., and to be seconded: November 10, 1915.

Lieut. G. C. de Dombasle, Royal Canadian Regt.: February 15.

Second Lieut. R. R. Money, East Yorkshire Regt., and to be seconded: February 27.

Lieut. F. V. Woodman, 32nd (Res.) Canadian Infantry Bn.; Lieut. P. E. M. Le Gallais, Royal Sussex Regt., and to be seconded; Temp. Second Lieut. W. Baillie, Royal Highlanders, and to be transferred to the General List; Temp. Second Lieut. J. G. Will, Leinster Regt.; Second Lieut. D. G. A. Allen, Durham Light Infantry, S.R., and to be seconded: April 1.

Temp. Lieut. D. A. D. S. MacGregor, A.S.C., and to be transferred to the General List; Temp. Lieut. H. Fowler, R.A., and to be transferred to the General List: April 19.

Temp. Lieut. D. M. Faure, A.S.C., and to be transferred to General List: April 23.

Temp. Second Lieut. R. G. H. Adams, Middlesex Regt.; Second Lieut. J. F. P. B. Quinlan, R.G.A., and to be seconded: April 25.

Flying Officers:

Second Lieut. E. Duveen, S.R.: March 2.

Capt. D. B. Gray, 48th Pioneers, I.A.; Temp. Second Lieut. A. Cairnduff, Royal Munster Fusiliers, and to be transferred to the General List; Temp. Lieut. P. G. H. Fender, General List; Temp. Second Lieut. P. A. Moodie, Royal Fusiliers, and to be transferred to the General List; Second Lieut. L. B. F. Morris, Royal West Surrey Regt., S.R., and to be seconded; Temp. Second Lieut. F. W. Honnet, General List; Second Lieut. P. Tremlett, S.R.; Second Lieut. R. H. Jarvis, S.R.; Temp. Second Lieut. R. D. Oxland, General List: April 16.

Second Lieut. G. H. C. Crooke-Rogers, Worcestershire Regt., and to be seconded: April 18.

Second Lieut. J. C. Griffiths, S.R.: April 19.

Lieut. G. W. Wentworth, Norfolk Regt., from a Staff Lieut. at War Office: April 19, seniority August 26.

Lieut. I. T. Lloyd, South Wales Borderers, and to be seconded; Second Lieut. R. D. Sampson, Worcestershire Regt., S.R., and to be seconded; Second Lieut. F. F. Hutcheon, S.R.; Second Lieut. J. A. G. Gilroy, S.R.; Second Lieut. A. C. Hatfield, S.R.: April 20.

Lieut. J. W. Langmuir, Motor Machine Gun Service, Canadian Expeditionary Force; Second Lieut. T. S. Sharpe, Gloucestershire Regt., S.R., and to be seconded; Second Lieut. N. Brearley, Liverpool Regt., S.R., and to be seconded; Temp. Second Lieut. G. H. Hackwill, Somersetshire Light Infantry, and to be transferred to the General List: April 21.

Capt. G. W. Webb, Royal Irish Rifles, S.R., and to be seconded; Lieut. L. G. S. Payne, Suffolk Regt., and to be seconded; Second Lieut. J. K. Parker, Royal Scottish Fusiliers, and to be seconded; Second Lieut. P. Arbon, S.R.; Second Lieut. J. Manley, S.R.; Second Lieut. (Temp. Lieut.) G. W. Swanson, Hampshire Regt., T.F., from an Assistant Equipment Officer: April 22.

Temp. Second Lieut. O. V. Thomas, Royal Welsh Fusiliers, and to be transferred to General List; Second Lieut. E. W. Edwards, Royal West Surrey Regt., S.R., and to be seconded; Second Lieut. G. H. Lewis, Northamptonshire Regt., T.F.: Second Lieut. J. B. Brophy, S.R.: April 23.

Lieut. O. T. Boyd, 5th Cavalry Indian Army, and Second Lieut. A. M. Thomas, S.R.; Temp. Second Lieut. A. G. Brooke, General List; Temp. Second Lieut. S. F. Brown- ing, General List: April 25.

Second Lieut. R. H. Cronyn, S.R.; Temp. Lieut. C. F. Portal, R.E., S.R., from a Flying Officer (Observer): April 27.

Flying Officers, from Flying Officers (Observers):

Lieut. (Temp. Capt.) C. C. Haynes, Devon Regt.: April 16.

Second Lieut. R. L. Chidlaw-Roberts, Hampshire Regt.: April 21.

Capt. A. V. Holt, Royal Highlanders, and Second Lieut. M. Jacks, East Lancashire Regt., and to be seconded: April 22.

Equipment Officers, from Assistant Equipment Officers, and to be Temp. Capt. whilst so employed:

Temp. Lieut. W. W. Tullis, General List; Lieut. J. E. Storey, S.R.; Second Lieut. (Temp. Lieut.) E. A. Jackson, 5th Yorkshire Light Infantry, T.F.; Qmr. and Hon. Lieut. G. Laing; Lieut. G. D. Hannay, S.R.; Lieut. J. T. Spittle, S.R.; Second Lieuts., S.R., J. P. Rowell, H. R. Lecomber, G. F. Underwood, S. S. Kennedy: April 26.

Assistant Equipment Officers:

Lieut. C. H. Awcock, R.A., from a Flying Officer: March 1.

Second Lieut. W. R. Lewis, S.R.: March 6 (substituted for notification in *Gazette* of May 8).

Temp. Lieut. J. L. Salway, Wiltshire Regt., and to be transferred to General List: March 13.

Second Lieut. (Temp. Lieut.) R. A. Law, Argyll and Sutherland Highlanders, T.F.: March 14.

Temp. Lieut. D. Sinclair, General List: April 3.

Temp. Second Lieut. J. L. Miles, General List: April 23.

Second Lieut. M. O. Darby, S.R.: April 24.

Second Lieut. W. R. Lewis, S.R.: April 25.

Second Lieuts., S.R., C. E. Robertson, B. J. Nicholson, and F. Alexander: May 2.

Second Lieut. G. R. Golding, S.R.: May 4.

Temp. Second Lieuts. to be Temp. Lieuts. whilst employed with the R.F.C.:

G. B. Ward, C. H. McDowell, A. J. M. Clarke, G. N. Teale, V. G. A. Bush, F. G. Wilson, H. L. Wallis, S. E. Parker, T. A. Oliver, G. G. Lever (on probation), G. W. M. Green, N. A. Bolton, A. Duguid, R. Raymond-Barker, E. R. Tempest, F. H. Furness-Williams, A. C. Hagon, E. S. Moulton-Barrett, A. D. Pearce, P. G. Scott, J. R. Philip, C. M. Gibson, R. H. Peck, G. H. Gordon, H. M. Whitehead, G. B. Hodgson, J. B. Tait, A. J. Insall, S. W. Price, J. L. M. de C. Hughes-Chamberlain, L. C. Powell, A. M. Miller, K. R. Binning, G. C. H. Dorman, W. H. Davies, W. K. Sutton, P. B. Hunter, H. N. Nowell: April 1.

To be Temp. Second Lieuts. for duty with the R.F.C.:

Cadet N. Goudie, from London Regt., T.F.: April 22

Cadet J. A. Kirker, from Dublin University O.T.C.: Pte.

L. E. Owen, from Inns of Court O.T.C.; Pte. W. H.

Longton, from 1st Worcestershire Yeomanry, T.F.; Pte.

L. F. Jones, from Royal Fusiliers; Pte. E. P. Jay, from

London Regt., T.F.; Pte. C. M. Clement, from 30th

Infantry Bn., Canadian Expeditionary Force; Sapper

E. H. Cambridge, from 2nd Field Co., Australian Engi-

neers; Rifleman A. G. Cardwell, from a Provisional Bn.,

T.F.: April 29.

Serg. E. R. Mackey, from Motor Machine Gun Service; Tpr.

K. Capel, from 6th Light Horse R., Australian Imperial

Force; Tpr. G. Campbell Body, from 6th Light Horse R.,

Australian Imperial Force: May 6.

To be Temp. Second Lieuts.:

G. Calvocoressi, whilst employed as an Interpreter: May 4.

Pte. S. H. Preston, from Inns of Court O.T.C., for duty with

the R.F.C.: May 6.

Lance-Corp. J. H. Banks, from A.S.C., to be Temp. Second

Lieut. on the General List for duty with the R.F.C.: March 13.

Second Lieut. H. Hemming, Worcestershire Regt., to be Temp.

Lieut. whilst employed with the R.F.C.: April 19.

Second Lieut. G. Mountford is granted temp. rank of Lieut.

whilst employed with the R.F.C.: April 1.

SPECIAL RESERVE

The notification of the appointment of J. H. Banks as Second Lieut., which appeared in *Gazette* of April 6, 1916, is cancelled.

Second Lieut. A. Livingstone-Allan relinquishes commission: April 30.

Second Lieuts. (on probation) confirmed in their rank:

R. H. Jarvis, A. C. Hatfield, L. F. Hutcheon, P. Tremlett,

J. A. G. Gilroy, J. C. Griffiths, P. Arbon, J. Manley,

M. O. Darby, A. F. Palmer, R. H. Cronyn, J. B. Brophy,

C. E. Robertson, B. J. Nicholson, and W. R. Lewis.

To be Second Lieuts. (on probation):

C. T. L. Millington, A. Champion, and F. Alexander: April 3.

G. F. Golding: April 6.

C. H. Whittington: April 10.

H. W. Mills: April 11.

A. R. Thomas: April 17.

C. Jarrott: April 18.

F. W. Roberts and C. R. Young: April 22.

J. M. Batting, F. C. Deane, S. W. Taylor, C. H. Biddlecombe,

G. P. C. Willeby, R. H. Timmis, and R. H. Norton-

Dawson: May 6.

S. G. Dowsett, G. Mackrell, R. S. Jameson, F. B. Baragar, N.

Greenwell, F. D. H. Sams, E. B. P. Barrow, E. C.

Pashley, L. F. Peaty, F. F. Woodyer, F. Stoner, E. S. T.

Cole, W. W. G. Beatson, L. D. Russell: April 29.

A. D. Spiers and C. L. de Beer: May 6.

The Christian names of Lieut. Charles Drury Fuller are as now

described, and not as in *Gazette* of March 5, 1915.

OFFICIAL NOTICES

THE AERONAUTICAL SOCIETY OF GREAT BRITAIN

WILBUR WRIGHT LECTURE, 1916

The Fourth Wilbur Wright Memorial Lecture will be delivered on Tuesday, June 6 next, at 3 p.m., in the Theatre of the Royal Society of Arts, John Street, Adelphi, W.C. The title is "The Life and Work of Wilbur Wright," and the lecturer Mr. Griffith Brewer, A.F.Ae.S. The Right Hon. the Lord Montagu of Beaulieu will preside. Tickets will shortly be available for distribution from the offices of the Society, 11, Adam Street, Strand, W.C., to which address applications should be made.

EDWARD BUSK STUDENTSHIP IN AERONAUTICS

Applications will shortly be invited for the above Aeronautical Research Studentship. The approved scheme provides that the award and control of the studentship are to be in the hands of a Committee, of whom three members are appointed biennially by the Aeronautical Society, and three by King's College, Cambridge (Edward Busk's old College), with two of the trustees of the Fund. The remuneration of the student will be at a rate not exceeding £150 per annum for a period of one year, with an extension in special circumstances to two years. The student will be elected by the Committee without examination, and shall not have completed his 25th year on the 1st day of October preceding the election.

The student will be required to make reports to the Committee on his work from time to time, and at the close to present a full report to the Aeronautical Society, the University of Cambridge, and the Trustees, and he may be required to deliver a lecture or lectures embodying the substance of the Report.

The intention of the founders of the Studentship is that it should be primarily for the purpose of encouraging and helping young aeronautical engineers to make a good start in their career.

Enquiries should be addressed to the Secretary, Aeronautical Society, 11, Adam Street, Strand, W.C., from which address application forms will shortly be procurable.

ANNUAL GENERAL MEETING, 1916

The Annual General Meeting of the Society will take place, as last year, immediately preceding the Wilbur Wright Lecture.

AGENDA

To receive and approve the Report of the Council on the state of the Society, and the Balance-sheet of Aerial Science, Ltd.

To discuss and determine such questions as may be proposed by the voters relating to the affairs of the Society, and to fill the vacancies on the Council for the ensuing year. Any voter desirous of proposing any subject for discussion at the Annual General Meeting shall give notice in writing to the Secretary, which shall be received by him by noon on May 23, 1916.

The retiring members of Council are:—Harris Booth, J. H. Ledebor, Lieutenant A. R. Low, R.N.V.R., Dr. T. E. Stanton, F.R.S., Squadron Commander F. K. McClean, Major-General R. M. Ruck, C.B., R.E., Lieutenant-Colonel F. H. Sykes, and Dr. R. Mullineux Walmsley, who are eligible for re-election.

Nominations of candidates for election to the Council shall be signed by the voters proposing them (two voters and no more), and must be received by the Secretary by noon on May 16, 1916, with an intimation in writing by the voters nominated that they are willing to serve.

The Council will also ask for approval of their action in postponing, on account of the war, the date of the Annual General Meeting.

By order of the Council,

BERTRAM G. COOPER, *Secretary*.

THE INSTITUTION OF MECHANICAL ENGINEERS—A general meeting of the Institution of Mechanical Engineers will be held at the Institution of Civil Engineers, Great George Street, Westminster, on Friday, May 19, 1916, at 6 p.m., when Daniel Adamson, member, will read a paper on "Spur-Gearing."

WHITECRAFT

An interesting little dinner took place on Friday at the Castle Hotel, Richmond, when Mr. Arthur Howitt entertained the original members of the Whitecraft Club and a few of the later members.

Those present in addition to the host included Mr. J. A. Whitehead (managing director of the Whitehead Aircraft Co., and founder of Whitecraft), Mr. J. Ward (works manager), Messrs. W. H. Beveridge and — Owen (visitors), Messrs. A. J. Macphail, A. Stebbing, W. J. Loosemore, A. E. Hagley, H. Crump, J. Kemp, J. Garner, E. Boyle, F. Wright, E. C. Baker, W. Chandler, O. Allard, M. Byl, W. Cory, and others.

An excellent dinner was served, and afterwards there were a few speeches. Mr. Ward expressed the appreciation of the gathering to Mr. Howitt for his kindness in entertaining them and remarked upon the keen interest that Mr. Howitt had taken in their doings from the very beginning. Mr. Howitt, in reply, said that it gave him the greatest possible pleasure to entertain them. Remarkable progress had been made, and it gave one great satisfaction to be associated with such a body of men.

Mr. J. A. Whitehead, in acknowledging Mr. Howitt's remarks, said that they had been able to achieve great things, and a very considerable factor in enabling them to do so was the good feeling that prevailed. There was no finer body of men than his men. Whitecraft was a society to bind together the best workers—the best manual workers and the best brain workers—and the society was rapidly growing. They were out not only to beat the Germans now but to lead the world in production after the war. Alluding to the success of his own company, Mr. Whitehead paid a great tribute to Mr. Macphail. "For what I have been able to achieve," he said, "I want to thank one man in particular, and that is my friend Mr. Macphail, who, as some of you may know, did something to help Mr. Cecil Rhodes to success." He was secretary of the Expedition to Rhodesia in 1894 with the Rt. Hon. Cecil Rhodes and Dr. Jameson on the occasion of making the report on the Mineral Resources of Rhodesia, and was London Secretary of various companies operating with the British South Africa Company. Mr. Macphail became associated with him (Mr. Whitehead) in the very earliest days of this enterprise, and now when they had achieved such a great measure of success, he desired to make that expression of his appreciation of what Mr. Macphail had done.

Mr. Macphail, who was obviously taken by surprise, said that he was not used to making speeches, but he felt bound to say that he deeply appreciated the remarks made by Mr. Whitehead. It was a curious coincidence that while being with Mr. Whitehead at Richmond he had once more come in touch with Dr. Hatch, the eminent mining engineer, who also went out to South Africa with the Expedition.

Mr. W. H. Beveridge, as a visitor and an engineer, said that the Whitehead Company astonished a good many people by their first achievement. Knowing what Mr. Whitehead had done he was sure that he would accomplish the new work that he had taken on in quicker time than many thought possible.

PATENT INFORMATION

This list is specially compiled for AERONAUTICS by Messrs. Rayner and Co., Registered Patent Agents, of 5, Chancery Lane, London, from whom all information relating to Patents, Designs, Trade Marks, etc., can be obtained gratuitously.

LATEST PATENT APPLICATIONS

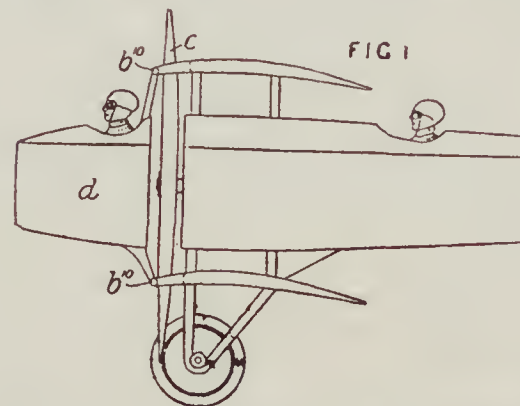
- 6,116 Aeronautical Instrument Co. Pressure-heads for air speed indicators. 28/4/16.
- 6,149 A. A. Holle. Planes, etc., for aeroplanes. 29/4/16.
- 6,156 D. C. M. Hume. Model aeroplanes and methods of constructing them. 29/4/16.
- 6,156 T. H. Holroyd. Flying machines. 29/4/16.
- 6,149 A. W. Judge. Planes, etc., for aeroplanes. 29/4/16.
- 6,122 E. J. March. Aeroplanes, etc. 28/4/16.
- 6,149 Varioplane Co. Planes, etc., for aeroplanes. 29/4/16.
- 6,132 R. Wright. Aircraft. 28/4/16.

SPECIFICATIONS ACCEPTED THIS WEEK

- 8,823 Harris. Aeroplanes.

LATEST PUBLISHED ABSTRACT

- 100,122 "Aeronautics." Soc. Anon. Spad pour l'Aviation et ses Derives, 19, Rue des Entrepreneurs, Paris. An aeroplane of the tractor type has an overhanging seat for the observer arranged in front of the propeller to give a clear field for gun-fire. Fig 1 shows a biplane in which the propeller *c*, rotates in a plane behind the front edges of the planes, which are recessed to accommodate the



propeller. A car *d*, having the shape of a penetration cone, is secured as shown to horizontal members *b* at the front edges of the planes. As applied to a monoplane, the car *d* is secured to the edge of the plane and is supported from beneath by a member pivoted to the chassis.

Full copies of the specification can be obtained from Messrs. Rayner and Co. at the price of 1s. each.

PETROL PRICES—The prices now ruling for motor spirit practically all over England and Wales are as follows:—Shell, 2s. 2d.; Shell II., 2s. 1d.; Crown, 2s.; Red Line, 2s. 8d.; Red Line II., 2s. 7d.; Pratt's, 2s. 8d.; Pratt's II., 2s. 7d.; Taxibus, 2s. 6d.; Mex, 2s. 4d.; Ensign, 2s. 6d. The prices of these brands average in Scotland and Ireland a penny higher.

AERONAUTICS

A WEEKLY JOURNAL DEVOTED TO THE TECHNIQUE OF AERONAUTICS

(FOUNDED 1907)

Edited by JOHN H. LEDEBOER, B.A., A.F.Ae.S.

VOL. X. No. 136 (NEW SERIES)

MAY 24, 1916

[Registered at the G.P.O.]
as a Newspaper

ONE PENNY

THE A.B.C.

ANXIOUSLY awaited by that section of the public which still retains a touching faith in the statesmanship of our present rulers—a faith which is sedulously fostered by the inspired portion of the Press for whom everything is still for the best in the best of all possible worlds and ever will be so long as the present Government remains in power—the so-called Air Debate in the House of Commons feebly spluttered out last week. The House of Lords is still to have its say in the matter, and will no doubt afford Lord Curzon a long-deferred opportunity for making his statement, which is expected with the greater interest since it was upon this noble lord's recommendations, as we are given to understand, that the present Government scheme has been drawn up. There is one consolatory thought in regard to the matter: the Lords' debate cannot well be more ineffectual than the mass of verbiage printed elsewhere in these columns.

* * *

So the Derby Committee is dead. Long Live the Curzon Committee? Given but a few more Committees and we shall surely win the war; if, that is, modern wars are won by political makeshifts. For, leaving the personal question aside, there is not the slightest use in boggling at the one fact which alone emerged from this orgy of words, and that is the fact that the new Air Board is simply the old Committee under another name, if only for the grave disability beneath which it suffers, and which, in the long run, will prove its undoing, namely, that it possesses neither administrative nor executive powers; its functions, as were those of its ill-fated predecessor, are purely advisory. No doubt, under energetic leadership the advice it will proffer is likely to be sound, but there is not the least guarantee that any representations it may make will receive the slightest heed. Besides, the world knows the fate reserved for good advice.

* * *

Briefly, the Board is to consist of a President (Lord Curzon), two naval representatives (one of them a member of the Board of Admiralty or who is to attend there when aerial matters are discussed), two military representatives (one of them to be a member of the Army Council), a member of independent administrative experience (Lord Sydenham), and a parliamentary representative (Major J. L. Baird, M.P. for Rugby). Such is the constitution of the Board. The choice of Lord Curzon was, no doubt, well advised; in default of special technical knowledge he does, at any rate, possess personality and administrative experience. The accession of Lord Sydenham may yet prove the salvation of the whole scheme and should prove a tower of strength to an otherwise unstable edifice.

* * *

So much for the constitution; now for its powers, or,

rather, its functions—for powers in the usual and precise sense of the term it possesses none. According to Mr. Tennant, who dolefully complained that he seemed to be regarded as a shock-absorber, "the Board shall be *free* to discuss and make representations. . . ." That word *free* is really delightful; it would seem to imply that so long as the Board confines itself to discussion and talk no obstacle will be placed in its way; but there its functions cease, save that in the case of disagreement between the two Services the Board is free to report to the War Committee, which is equally free to ignore the report. Meanwhile the administration of the Air Services is to be left precisely where it was.

* * *

The trouble with all these Committees, and, in fact, with the whole organisation of the Air Services, has been an entire lack of constructive insight and a total failure to foresee inevitable impending development. And this criticism is fully as applicable to present and past Governments as to Government critics. On one side we have clamourings for an Air Ministry and a single independent and cohesive Air Service. In the main, viewed from the ordinary standpoint of logic, such a demand was more than justified—some years ago. I will confess that I even publicly initiated it full three years back; so also I will confess that not a thing that has since happened has led me to alter my views—not a thing save the war. A separate Air Service will inevitably come about, and with it a responsible Air Department at its head. But a time of national crisis, such as the present, is not one to attempt to reorganise what, willy-nilly, can only be regarded for the time being as integral branches of the two respective fighting Services; for by attempting this you are simply interfering with Service traditions; you are tampering with military or naval training, and that is a process which, in war time, is necessarily fatal. Besides, the task of immediate reorganisation, root and branch, of two independent Services and their amalgamation would tax the powers of the veriest superman. No, since we embarked upon the business we shall have to carry it through as best we can with the means at our disposal. In other words, it is too late now to attempt to recast the higher command of the two Air Services and to remodel it upon uniform lines. Questions of military policy must be left to the responsible heads now in charge with all the machinery at their disposal which they have created and with all the specialist knowledge that they have accumulated.

* * *

Remains the acute question of the provision of material, wherein we include, paradoxical though it may seem, that of personnel, or that of cannon—or, if Mr. Billing prefers, of Fokker-fodder. Properly regarded, the war—in the air as

well as elsewhere—resolves itself into two distinct phases, which are largely independent, in point of organisation, one from the other. There is first the strategical and tactical conduct of the war, a purely military matter; but next, if not more important still, is the provision in superabundant quantity of the material, inanimate and human, armament and men, machines and pilots—look at it how you will—to enable the necessary military operations to be carried to a successful conclusion.

* * *

And it is this latter aspect of the question which has to be dealt with first and foremost in regard to aerial navigation. To view the matter in another light—we have to establish a board of aerial munitions before we can hope to realise the great aerial offensive and bring into being that supremacy of the air which we all hope for and so many of us discuss at profitless length. And the realisation of this cardinal fact should have been the primary function of the new Aerial Board of Control, foreshadowed by Kipling in his wonderful "Night Mail." It is on the failure to realise this aspect of the subject—on the failure to endow the new Board with executive powers in this aspect, powers which, had they been granted now, as surely they will be eventually, would have laid the sure foundation for the impending Air Ministry—it is on this failure that we base our criticism of the Board as at present constituted.

* * *

It may be objected that these are mere words; that criticism is easy; that a concrete constructive policy has never yet been advanced by experts, and that in consequence the politicians have hitherto had it their own way,

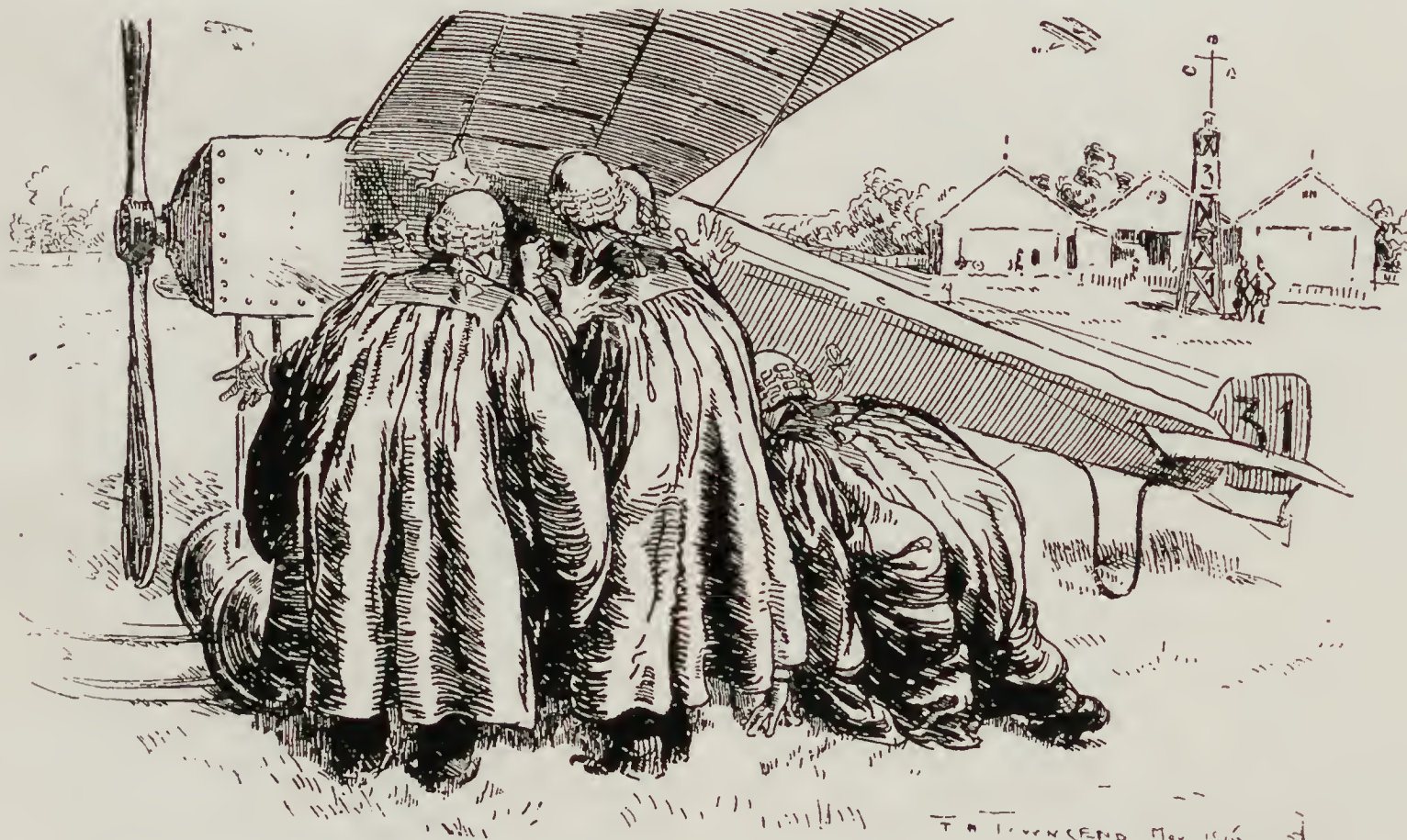
with the result that the air question as a whole has been—as one scribe said of the Billing fiasco—"snuffed out; snuffed out; and the House was glad to rise."

* * *

So here goes in brief for a constructive policy, which various considerations have prevented me from making public before now: (1) The unification of the two existing inspection departments under single control—constructional materials *in all essential cases being identical* for the requirements of both Air Services; (2) the standardisation of parts on a large and comprehensive scale (a reform which would be welcomed, as it has long been advocated by every single responsible manufacturer); (3) the unification of methods of training pilots and mechanics and the co-ordination of the existing military and naval schools and aerodromes. A pupil, whether destined for the R.N.A.S. or the R.F.C. should in every case receive precisely the same preliminary training. It is absolutely immaterial, until he has obtained his certificate and undergone the subsequent training which alone can make him a pilot, at what centre, under what service conditions or traditions he has been trained. Specialisation and differentiation only comes later. Here is a fruitful basis for immediate reforms, reforms which—and this is a point of vital importance—the new A.B.C. should be able to put into immediate execution without the dislocation of any existing arrangements. Only, these are matters requiring technical evidence which a committee of lawyers would be wholly unable to sift. Besides, there is the vast question of industrial organisation. . . .

J. H. L.

THE AIR SERVICE ENQUIRY



By permission of the]

[Proprietors of "Punch."

FIRST STEPS TO VICTORY

(Quartette of Legal Members of Committee of Inquiry into the Administration of the Royal Flying Corps.)

Messrs. A, B, C and D in consultation, all talking together. "THE CONTRIVANCE IN FRONT, BY REVOLVING, PRODUCES MOMENTUM. DO I CARRY YOU WITH ME?"

"MY LEARNED FRIENDS MUST ADMIT THAT THE PILOT HAS AN *a priori* RIGHT TO THE FRONT SEAT AND A LIEN ON ALL PETROL."

"MY CLIENTS DENY BUILDING THE MACHINE; AND IF THEY DID SO THEY DID IT IN GOOD FAITH AND IN THE PUBLIC INTEREST."

"I SUBMIT THAT THOSE PREMISES SITUATE BEHIND THE ENGINE SHOULD BE PAINTED OUTSIDE IN FOUR GOOD COATS OF OIL COLOUR EVERY THREE YEARS, AND BE IN ALL RESPECTS KEPT IN GOOD AND TENANTABLE REPAIR, ETC., ETC., ETC."

SOME NOTES ON THE DESIGN OF AERO-ENGINES

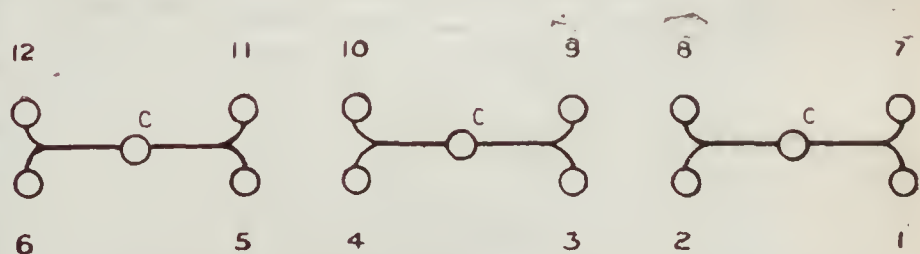
By JOHN WALLACE

(Continued from page 320)

Now to give some suggestions regarding the design of the high efficiency, high speed aeroplane engine. The essential features of this type of engine are, first of all, light reciprocating parts combined with ample valve port areas; these two must be designed the one in conjunction with the other. The pistons must be free from unequal expansion and the utmost attention must be paid to piston-clearance. While on the question of the expansion of pistons, it can very well be stated that a piston carrying the gudgeon pin bosses in the piston walls cannot expand equally, and if the piston be light warping is bound to occur; this is particularly the case with steel pistons. The only satisfactory method is to secure the gudgeon pin boss directly to the piston head. Incidentally, this mode of construction results in a considerably lighter piston. The combustion chamber should be of as efficient a shape as possible; that is to say, the area of that part of the internal face of the chamber which is uncovered when the piston is at the top of its stroke must be kept as small as possible, while pockets of any type should be avoided. It is essential that friction be reduced to a minimum, while the cylinders, valves, and ports must be effectively cooled. Air cooling is most undesirable for any but exceptionally small motors, inasmuch that without the use of heavy and cumbersome casings and fans the cooling is most irregular and unequal. Water cooling having been adopted must needs be by pump, and large inlets and outlets should be used in order to obtain a good circulation without absorbing any more power than necessary. The carburation should be as near as possible to perfection, for with an indifferent mixture no engine can develop its maximum power. In cylinders of more than 3 in. bore at least two plugs should be used whose sparkings are synchronised; the best means of attaining this end is by a double-spark magneto. It is most desirable that internal vibration be reduced as far as possible, otherwise the bearings will have a very short life indeed. The last, but by far the most important essential of all, is a thorough lubrication system. A large number of aero-motors are provided with forced lubrication to the main crankshaft bearings, splash lubrication being relied upon for the remainder. This system may work fairly well on low speed low efficiency engines, but for high speed motors a complete system of pressure feed is essential. The oil should be forced to the main bearings and then to the big-ends, whence up the connecting rod to the little end bearing, the oil then passing through a hollow gudgeon pin to the cylinder walls; it would then fall to the false bottom of the crankcase, and, having been strained, drawn back into the oil pump to be circulated again. Incidentally, the oil pump should be placed in as accessible a position as possible. The difficulty of forcing oil through a hollow crankshaft is easily overcome by the insertion of soft metal pipes, as was done in the Simms engine. Ample provision should be made for the effective lubrication of the camshaft, valve gear, and all gear drives. The overhead valves of the high speed engine frequently suffer from the distressing malady of sticking in their guides; this may easily be prevented by the correct design of a valve rocking lever, which will reduce to a minimum the side pressure on the valve stem.

As for the general lines of the engine, there exists a great amount of prejudice against the horizontally opposed type of motor. A point frequently raised against its use is that its head resistance is necessarily larger than that of a V engine of equal power and number of cylinders. This is not so; as a matter of fact, it is possible to design a horizontally opposed motor with a smaller projected area than

can be done with a V engine similar in all respects. Also the opposed type of motor does not necessitate an exceptionally wide cowl, for the heads of the cylinders may be allowed to project from the sides of the fuselage with beneficial results to the cooling of the cylinder heads and the accessibility of the valve gear. From the engineer's point of view the opposed type is greatly superior to the V engine and allows of a lighter crankcase. In a V engine the cylinder bolts cannot reasonably be made to secure the crankshaft bearing caps, and, in consequence, the crankcase will need to be appreciably heavier. Generally speaking, a much better order of firing may be obtained from the horizontally opposed engine, resulting in less whipping of the crankshaft. This is particularly the case in the 12-cylinder motor, when, if it be of the opposed type, the following sequence, which is almost ideal, may be obtained:—1, 8, 3, 7, 2, 9, 6, 11, 4, 12, 5, 10.



This order also gives excellent carburations with three carburetters; no one carburetter is called upon to supply two cylinders which fire consecutively. This order of firing cannot be obtained if the cylinders be set V fashion, if the standard type of 6-cylinder crankshaft be used. The opposed engine is much more accessible and is not so difficult to build as the V type. Also a horizontally opposed motor will run at a higher speed of revolution and develop more power than a V engine identically the same. While speaking of engines in which two opposite cylinders work on to the same crank it would be worth while to discuss the various methods of attaching the connecting rods to the crank pins. There are three possible methods, one of which is to fork the rods. In this case one rod is forked at the big end and contains the bush, the other rod is fitted between the forked end of the first rod and is white-metal lined and works on the outside of the bush. As both the bush and the big ends of the rods are split, the fitting of these rods is a very skilful operation, and once taken apart after some wear has taken place it is nearly always necessary to fit a new bush and to scrape the white-metal of the inside rod. Another method, the originator of which ought to have known better, is similar to the arrangement used on radial engines. One of the pair of rods carries a lug on its big end. To this lug is attached the other (secondary) rod by means of a pin. As mentioned before, this is about as unmechanical a method as is conceivable, and in order to grasp fully the disadvantages of this arrangement the reader should construct a working model in cardboard—to explain them all in this article would take up far too much space. However, to point out one or two of its worst points, let it be said that when the piston attached to the secondary rod is subjected to the pressure of the explosion or to that of overcoming the compression, as the case may be, according to the direction of rotation, a considerable pressure is placed upon the gudgeon pin and piston of the opposite cylinder. To say the least of it, this is most undesirable. Also the path of the auxiliary pin which secures the one rod to the other is elliptical, and consequently considerable un-

balanced forces are present in the motor. Another point about this arrangement is that the speed of the one piston is different from that of the other piston at corresponding positions in the strokes. One could well devote a whole article to this interesting system, but, unfortunately, I am compelled to restrict my remarks to the above, which is, I am afraid, a rather vague description of its workings. However, if any intelligent person studies the workings from a cardboard model for about ten minutes, he will immediately wonder what planet could have been affecting those designers who have adopted this plan; and yet this system is used in quite a large number of aero-motors.* The remaining arrangement is also by far the best one from all points of view—that is, the system of placing the connecting rod big-end bearings side by side. Of course, this involves staggering the cylinders, but even so it does not result in a very much larger engine. When this system is used the crank pins should be as short as possible in order to obtain a rigid crankshaft: this may easily be done if the diameter of the shaft be slightly increased.

I have not yet mentioned the important matter of obtaining an efficient propeller speed. It is generally recognised that the most desirable speed for an aeroplane propeller lies somewhere between 850 and 1,100 revolutions per minute; above this particular speed the efficiency of the propeller falls considerably, which being the case, it will be necessary in a high-speed engine to drive the propeller from a lay shaft through the medium of some reduction gearing. Of course, a certain percentage of power will be lost in this gearing; but here again it will be largely a matter of accurate manufacture and afterwards of effective lubrication. Care having been taken to secure these conditions, and providing that the lay shaft ran on well-designed bearings, then 97 per cent. efficiency could be secured if the speed reduction be effected through spur gearing.

Considering the increasing demand for high-powered aero-engines—that is, engines of over 200 b.h.p.—there is a surprisingly small number of this size at present on the market. Now it is obvious that the large gun-carrying seaplane, carrying effective armour, cannot be produced until a really reliable high-power motor, light in weight, has been marketed; which being the case, it would be interesting to consider the requirements of such an engine. In the first place, it will need to be provided with some mechanical starter, for the man who could pull or crank over a 250 h.p. high-compression engine would be a man amongst men. In any case, it would be a rather difficult task to perform after having alighted on a rather choppy sea; but, apart from all that, pulling an engine over by means of the propeller in order to start the engine is a risky business at any time, and the sooner it can be done away with the better. There are three practicable mechanical means of starting an engine. Compressed air starting is used on several cars with fairly good results, but as to whether it is suitable for aeroplane engines is doubtful. This system has also been tried on aeroplanes, and in nearly every case a chamber of compressed air was taken on board at the starting place. An objection to this method is that after having made a few stops away from his base the pilot may find himself without the means of starting his engine. The alternative is to instal a compressor driven by the aero-motor. It is usual, when separate chambers are carried, to use a pressure of about 120 atmospheres; but it is almost impossible to carry a compressor on the above plan which will compress the air to the required degree. So far as the electric starter is concerned, I have personally never heard of an engine of over 90 h.p. being started by this means, and then only four startings were possible with one charging.

The proposition of a very small petrol engine for the purpose of starting the larger motor has received little or

no attention whatever. Of course, it would require a clutch and a reduction gear to the larger engine, but even so it would not be an expensive attachment; while the whole outfit need not exceed 30 lbs. in weight. This small engine, of about 700 cubic centimetres capacity, should preferably have six cylinders, otherwise there would be a distinct tendency for it to stop on the engagement of the clutch. A four-cylinder engine might do the job, but it does not possess the overlapping power impulses of the six. An engine with so many small cylinders could be started by a light pull-over compression by means of a shaft brought right back to the pilot's seat. An engine designed for 3,000 revolutions per minute, and geared down to 12 to 1 to the big engine, should work admirably. Not only could this engine be used for starting, but also, if water-cooled, be used for driving the motor for a wireless installation. At any rate, the idea has possibilities.

Speaking of the large engine, it would be well to remember that there is not the slightest reason to suppose that the propeller will continue for very long to be driven directly off the engine shaft. With the introduction of the double fuselaged machine, with two or more engines and propellers, some sort of transmission gear will need to be devised, and that will doubtless result in the speed reduction to the propeller, being carried out in one with the said transmission gear. Regarding the question of driving two propellers from one engine, it cannot be denied that the present practice of using chain transmission is most undesirable. The accident to the Wright biplane, resulting in the death of Lieutenant Selfridge, was sufficient to point out the danger of this plan. I remember a well-known Government official speaking on this question, and he suggested driving the propellers through two shafts, meshing with a bevel gear on each end of the crankshaft. One objection to that arrangement is that it would necessitate placing the engine athwart the aeroplane, and, among other difficulties, it would increase the head resistance of the machine enormously. However, the introduction of the twin-engined aeroplane is not far distant, and then these difficulties will be removed. But when one meditates on the matter of driving propellers through transmission gears, one cannot help wondering as to who will build the transmission gear—the maker of the engine or the constructor of the aeroplane? The latter's knowledge of engines is usually about as extensive as is the engine designer's knowledge of aeroplane design, and consequently difficulties would be bound to arise. Personally, I wonder why the aeroplane constructor does not also build his own engines, and I fear that until that state of affairs comes about little progress can be made with really large aeroplanes. Imagine a car manufacturer building his own chassis and installing engines designed and built by some other concern. Certainly a first-class vehicle could not be produced by this means. If an enterprising aeroplane builder were to employ the services of a thoroughly capable engineer to design the engines for his machines, he would never regret it. Generally speaking, the aeroplane constructor is a totally different kind of man from the motor manufacturer. The latter, who is rarely an engineer in the true sense of the word, is essentially out to make money, whereas the aeroplane builder is usually a man to whom his profession means quite as much as his income, and in the real aero-motor engineer he would find a man after his own heart.

The reader will probably consider my various remarks concerning the motor manufacturer and others to be somewhat out of place in an article on engine design, but, as I have said before, they have been made in the hope of pointing out the difficulties besetting the man with original ideas. If a really successful aeroplane engine has not yet been produced, it is not because such an engine has never been designed: it is merely owing to the fact that the inventor in this country is given far less encouragement than that given to the lowest of music-hall artists.

* R.A.F., among others.

PROGRESS OF AMERICAN AVIATION

By ERNEST L. JONES, American Editor

THE ROBINSON RADIAL MOTOR

IN a recent issue (March 1, 1916) we gave a detailed description of the Grinnell aeroplane, designed by W. C. Robinson, who holds the American non-stop cross-country record of 332 miles made on October 17, 1914, on a Grinnell monoplane, fitted with a Robinson radial motor developing 100 b.h.p. The flight lasted 4 hrs. 44 min., and consumed 45 gallons of petrol and 7 gallons of oil. The photographs herewith show the first Robinson motor built. Some refinements are being made in the new engines. Its performance speaks well for the motor, and the design is novel and simple.

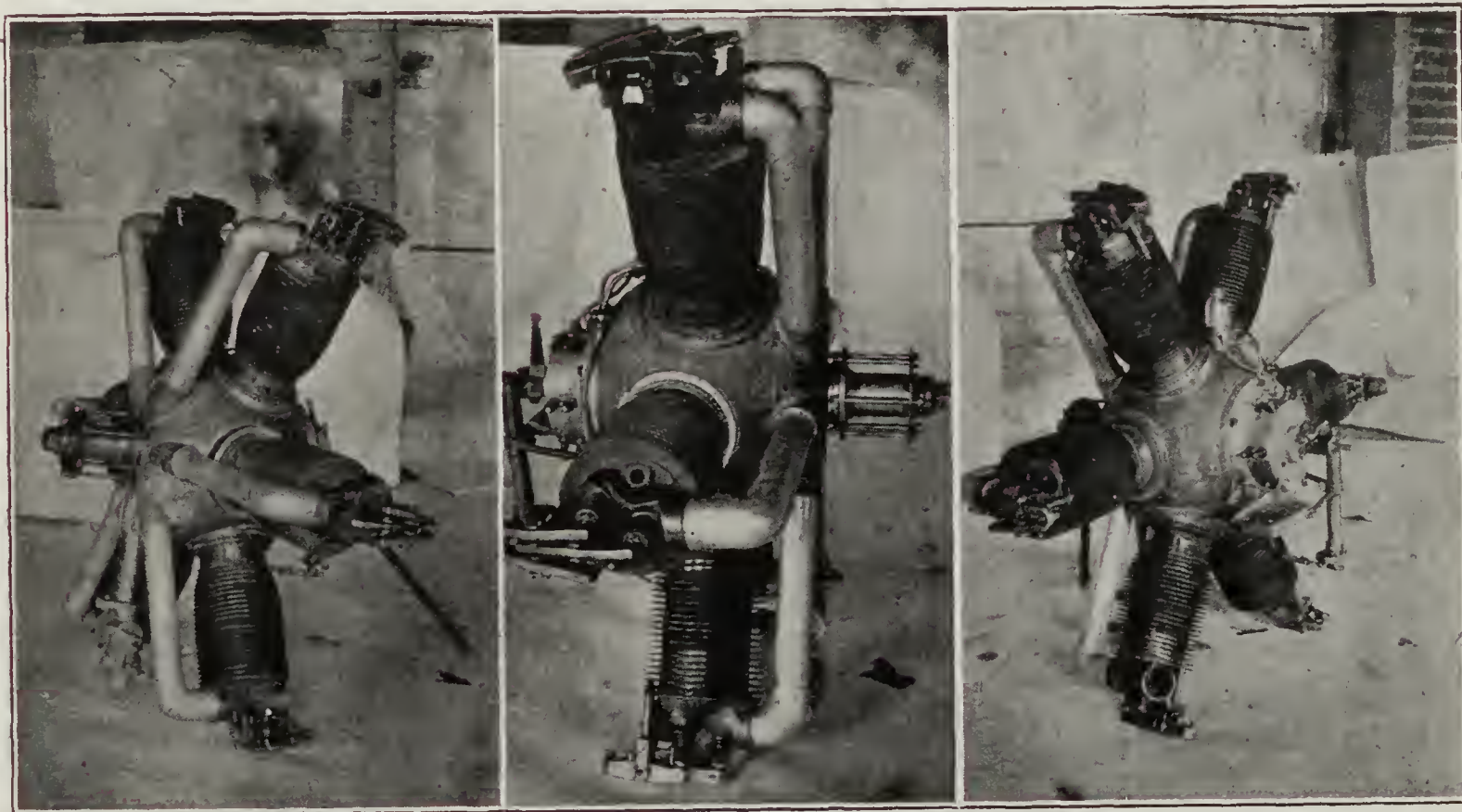
There are six cylinders, 5 in. by 6 in. bore and stroke respectively (60 h.p. A.L.A.M. rating). It turns a propeller 8.5 ft. diameter by 6 ft. pitch at 1,400 in the air. No brake tests have been made, for Mr. Robinson did not have the use of dynamometers nor even a fairly complete machine shop in which to build the motor. The weight is 300 lb., with magneto, carburetter, pipes for oil system, etc., ready to put in the machine.

is made by dividing part of the crank case. The gas does not enter the rest of the case, but obtains heat therefrom naturally. A Master carburetter 2 in. in size is attached to a short vertical feed pipe, which screws into the manifold part of the case.

The crank shaft is a two-throw chrome nickel steel affair, 2½ in. in diameter, with 3 in. bearings, except the one next the propeller, which is 4 in. long. The bearing boxes are plain bronze, unbabbitted.

Three connecting rods operate from each throw. The inner end of the rod is a segment of a circle, and the rods are held in place by retaining rings which go over the lateral extensions of the segments. The wrist pin bushing is of "plastic" bronze. The rods are of chrome nickel steel, machined round, and drilled to form a tube.

The pistons are of grey iron, with two rings, ribbed inside. These are drilled for lightness. The piston pin screws into a boss in the piston, and the bearing turns around the pin.



THE ROBINSON RADIAL MOTOR

The cylinders were cut out of a solid billet of chrome nickel steel, and they are screwed into the Lynite crank case. A locking ring then screws down against the case, and the locking nut itself is stopped from moving by a set-screw in one of the holes in the cylinder wall. The cylinder head is of cast-iron welded to the cylinder by oxy-acetylene process.

The valves are of tungsten steel. There are two exhaust valves and one intake valve in each cylinder, 2⅝ in. and 2½ in. in diameter respectively. Stamped (U-shaped in cross section) rocker arms of thin sheet steel, cupped and welded, operate the valves, the rocker for the intake operating in the opening of the V-shaped exhaust rocker. Push rods of steel tubing operate the valves, working off two cams on a gear in the case.

The intake pipes, of aluminium tubing, are welded to the elbows which enter the combustion chamber, and are held by a packing gland and ring. The lower end fits closely the section of the case which forms the manifold, thus providing for expansion and contraction of these pipes, which is found to be comparatively great. This manifold

The cam mechanism is very simple, there being but one cam for the intake and one for the exhaust. One gear is fastened to the "rear" (the end opposite that with the propeller shaft) end of the crank shaft. Meshing in this are two idle gears which engage the inside of an internal gear and drive the latter at one-half engine speed. To the internal gear is fastened the two cams. The firing order is consecutive, in the opposite direction to the rotation of the crank shaft—i.e., first on one throw of the shaft and then on the other.

The oiling is by force feed through gear pump on the rear end of the case. Oil is forced direct to the main bearings and then through the hollow crank shaft to the connecting rod bearings, and through the hollow connecting rods to the piston pin bearings and the cylinder walls. Oil does not get into the lower cylinders, as they project into the case; and as the oil accumulates at the bottom of the case it runs to the lowest point and is pumped back to the reservoir.

The cylinders are offset, three being 1½ in. back of the other three. The connecting rods, it will be seen, are not

in the centre of the cylinders, as shown also by the wrist-pin ends, which are offset.

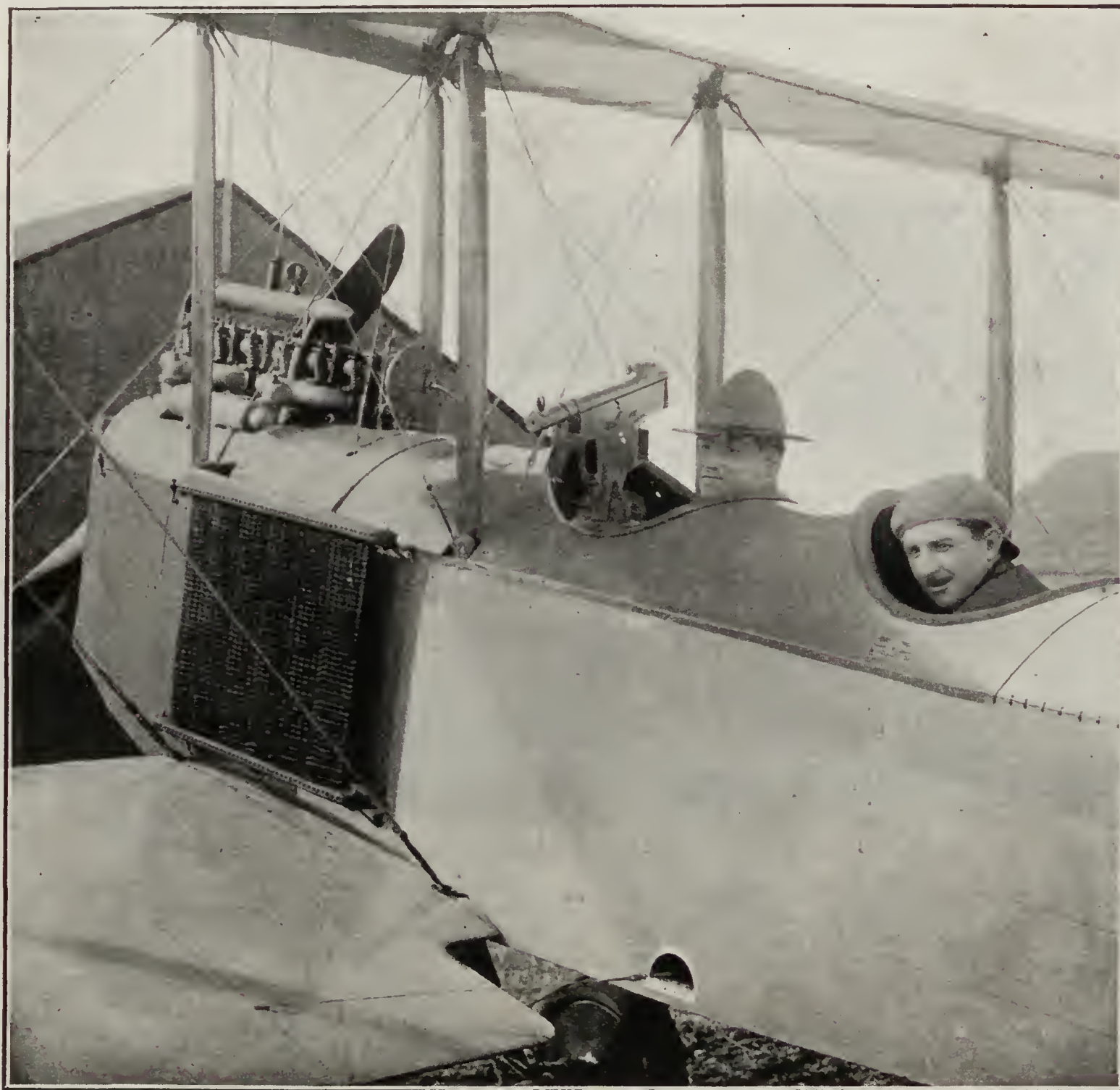
The crank case is cast in one piece of Lynite, which is becoming very popular for pistons and other parts in aero and auto engines in America. The case is ribbed for strength. The thrust bearing is inside the case, and is suitable for either tractors or pushers. Starting crank and tachometer will be attached to the rear end. The pump and Dixie magнето now drive off spiral gears on the extension of the rear end of the crank shaft. On the new motors the crank shaft itself will be lengthened and brought outside the case, and the oil pump gears will be in the bottom of the crank case in the new motors, whereas they are now driven from a gear on an extension to the rear end of the shaft.

The machine used was a model R-2 Curtiss military tractor aeroplane, equipped with a model V-2 Curtiss motor, rated at 160 h.p. MacGordon left Newport News at 10.35 a.m., and followed the Potomac River up to Washington. He circled the Capitol and then started back, arriving at Newport News again at 3.20 p.m. A twenty mile cross wind was encountered the entire distance, but not the slightest trouble was experienced during the entire flight.

Stephenson MacGordon, at the Atlantic Coast Aeronautical Station, established a new American altitude record on April 8, when he climbed 14,800 ft., carrying a passenger.

The flight was made with a Curtiss model R-2 military tractor, equipped with a Curtis model VX 160 h.p. motor.

Another American altitude record was established on April



VICTOR CARLSTRÖM ON HIS WAY TO THE MEXICAN FRONTIER

THREE NEW CURTISS RECORDS

THREE new records were established during the past month by Curtiss machines. A new American cross-country flying record was established on Saturday, April 1, by Stephenson MacGordon, a Curtiss pilot, who flew from Newport News, Va., to Washington, D.C., and return, without alighting. The distance covered is estimated at 300 miles. MacGordon carried a passenger, and made the flight in four hours and forty-five minutes.

19 at Newport News, when Victor Carlström climbed 11,100 feet with the Curtiss model R-2 tractor, carrying two passengers. The machine was equipped with the Curtiss model VX 160 h.p. motor.

U.S.A. EXPORTS—Domestic exports of aeroplanes during February, 1916 :—

	Number.	Dollars.
Aeroplanes	1	22,320

RANDOM REMARKS

XLIX.—IMITATIONS

By ARTHUR LAWRENCE

IT has too often been said that imitation is the sincerest form of flattery; but it has its embarrassments. I remember a story, and although it was cleverly written, I cannot recall the name of the writer, where a certain youth who was, perhaps, head of the school, and, generally speaking, the cock of the walk, was so much admired by a lad of tenderer years than himself, that the said lad copied his mannerisms and, within the limits of his ability, made himself a precise

copy of his own youthful god. The god was flattered at first; but, gradually the thing got on his nerves. It was like seeing yourself mirrored and mocked. He tried to knock into the lad different ideas, but the lad took it all in good part, and probably put the same treatment across some smaller boy. I don't remember the climax. Perhaps the elder boy indulged him-

self in justifiable homicide, or was sent up to Cambridge.

If imitation can be defended, we have noticed how lavishly proprietors of various commodities spend their money so that our tradesman shall not pass us off with "something as good." It has sometimes occurred to me that the substitute may be much better; but, as some sort of faithful journalist, I have banished the thought. Give me the well-advertised thing as belonging to those who show that they have something to lose, and I will leave the discussion of who pays for the advertising to my old friends of the Sphinx Club and to other slightly expensive, but sociable, organisations. Yet, after all, there are imitations and imitations, and one has to discriminate. I have had a sideboard made for me by careful workmen, in the manner of Sheraton, and I have prized that sideboard very highly. It could not have been better made. I was as proud of it as I should have been ashamed of myself if I had allowed it to be thought that it bore the master's imprimatur.

All that sort of thing notwithstanding, so far as individuals run after this great man and that they are dodging the chance of developing their own individuality and, to that extent, have lost their own souls. We know the man who is unconsciously quoting the morning and evening newspapers, and has never a word of his own. If any people are ruled by the Press, it must be the rule they deserve. It was somewhat to the wisdom of one of the later of newspaper owners when he decided that people were not necessarily such fools as they looked, and might like a good deal more news and a great deal less comment. Nowadays the electorate, one has noticed, on many occasions do think and vote for themselves. The squire has his view, and his tenants another. In a General Election I have noticed that "wins" on one side and the other were often in con-

stituencies where the candidate had the entire local Press against him. It isn't worth while bothering about papers in these later times. The palmy days of the *Eatonswill Gazette* are no more.

Sometimes even the great man is more the understudy of what he is reputed to be than the slap-up genuine article. It was Bismarck—was it not?—who described the late Lord Salisbury as "a lathe painted to look like iron." It is not for me to suggest that our great Foreign Minister was not the heaven-sent diplomat which so many believed him to be, but, at the present moment, the cession of Heligoland, for example, does not appeal to one as representing any excessive effort of genius. Even the old anti-Russia pro-Turk policy looks as if a lot of money was very carefully placed on the wrong horse. The passage of time or moments of very great strain will erase or break every substitute for the real thing. Even in the trivial matter of composition the oft-repeated admonition of the schoolmaster to study the style of Macaulay and So-forth and So-and-So is usually followed by rather distressing results. The man who is true to himself will go no further than his native ability can carry him, but he will travel some way and no man shall prevent him. In speech, I like to hear the man's own native lingo. Any sort of affectation is anathema maranatha to me.

But this, as so often has been my wont, is taking us a little apart from the question of imitations. Sometimes the flattery of imitation is of interest to those flattered; but, to those who look on, the ears, and sometimes the nose, are apt to protrude from the lion's skin, which, in its turn, may become somewhat tarnished. It is strange to me that when such a war as this brings out the absolute in so many men, that I hear the Bible and Tennyson, but never of "De Imitatione Christi." I wonder how present events would appeal to one of my dearest old friends, Thomas à Kempis. Perhaps there are some we should imitate, and others whom we should not. So far as I have raised this point, there let it rest. It may be that there are just a few—very few, I should think—who have been amused with my wanderings, or who may have even thought with me, who may care to know that this is my last appearance in AERONAUTICS. Hence the *atque vale* which must ever be uttered, and in these, my few final words, I take leave of my too-patient audience with the shrug and the bow of the *Entente Cordiale*, and—just a bit of that Celtic feeling which is sometimes permissible—under restraint.



STATEMENTS IN PARLIAMENT

HOUSE OF COMMONS

May 15—*Zeppelin L 15*—Mr. Fell asked the First Lord of the Admiralty whether the steam drifter *YH 87*, in the service of the Admiralty as a patrol boat, found the *Zeppelin L 15* damaged in the Thames estuary and made a rope fast to it, and took on board the commander and four of the crew of the airship, and held on for an hour, and, if so, would some recognition of an honorary nature be made for this service.

Dr. Macnamara said the drifter was one of three patrol vessels to which the *Zeppelin* surrendered. The conduct of the officers and men of all three was all that could be desired, but the circumstances did not call for any special recognition.

May 16—*The Zeppelin Raid on the East Coast*—Mr. Tennant, replying to Sir A. Markham, who asked whether he had any information that telegraph and telephone wires were cut in the vicinity of a town on the East Coast recently visited by *Zeppelins*, said: I do not confirm and I do not contradict the suggestion contained in this question. I simply state that it is not in the public interest to give any information on this subject.

Sir A. Markham asked whether it was not in the public interest when wires were actually cut between headquarters that the public should know that alien enemies were living in the district.

Mr. Tennant: I think it is very undesirable to make public comment on this subject.

May 17. *The Air Service*—Mr. Joynson-Hicks moved: "That His Majesty's Government should without delay take every possible step to make adequate provision for a powerful air service." His condemnation of the Government and the various departments concerned arose, he said, from the fact that they had had ample and definite notice of the position of affairs in regard to aerial defence and attack, and that Ministers had not taken sufficient notice of the warnings that had been given. He almost despaired of getting the First Lord of the Admiralty to realise what was needed for the air service. The First Lord and his Board were splendid in regard to Dreadnoughts, but he (Mr. Joynson-Hicks) thought they did not like the air service, and regarded it as an excrescence on the Navy which ought to be got rid of.

After the last debate Mr. Tennant asked him to go over to the Horse Guards Parade to see what had been done in regard to the defence of London. Very great improvements had taken place in regard to notification, telephonic and otherwise, but the officer who showed him round with very great pride pointed out that it had all been done since January of this year. The complaint was that the civilian had been trying to make the War Office do it since January, 1914.

Mr. Joynson-Hicks added the fact that improvements had taken place at such a time was a condemnation of somebody. With an Air Minister they would know who was responsible. The real trouble in regard to the air service was lack of imagination on the part of the heads of the Services in that House in regard to what could be done. We had not yet got command of the air in Flanders. In the early part of the war we had it, but it was the bravery of our men, in spite of the inadequacy of their machines, that beat the Germans. The hon. member went on to refer to a case in which a captain in the Royal Flying Corps made a reconnaissance on a machine of a certain type, and in doing so flew above the clouds, because he said it would not be safe to fly below the clouds at a height of 3,000 feet. His superior officer replied that he would fly the machine below the clouds, and, doing so, was brought down that same evening by a German anti-aircraft gun.

Mr. Billing (who was sitting on the benches below the Special Strangers' Gallery outside the Bar) exclaimed, in a loud voice, "Shame." (Cries of "Order.")

The Speaker: I must inform the hon member for East Herts that as he is sitting "outside the House" he is not entitled to interrupt.

Mr. Billing, rising to address the Speaker, was greeted with renewed cries of "Order," and "Come into the House." He thereupon came round and occupied his usual outside corner seat on the Opposition side, explaining that he was not aware that he was outside the House.

Mr. Joynson-Hicks, continuing, observed that what he laid particular stress on was not so much defence against raids by *Zeppelins* here as absolute command of the air at the front.

Mr. Barlow (U., Salford, S.) seconded the motion.

MR. TENNANT

Mr. Tennant, replying for the Government, said that if he was not, to use a classic phrase well known in the motor trade, a shock absorber, he would have been surprised at many of the statements made by Mr. Joynson-Hicks, but he had received so many shocks of this kind that he had become inured to them. Again, on two or three occasions when Mr. Billing had attacked the Government on this question he had given the House a great deal of information. The hon. member had brought forward statements from certain sources making allegations which it was impossible for him in his position of a responsible Minister to answer without giving information that it would be undesirable to give.

With regard to what had been done at home, he would like the House to realise that the system of warnings which had been set up, and which had been adopted for home defence was now complete. In regard to guns and lights, he did not want to say that they had all the guns they wanted, but they were getting them, and there had been a very great improvement. He did not think it at all proper for persons who were in the employment of the State to make the kind of allegations which had reached the hon. member. That was a kind of

thing which ought not to be encouraged. Complaints by persons in the service of His Majesty used as a stick with which to beat the Government—surely that was not to be encouraged.

Mr. Joynson-Hicks: I think my right hon. friend is a little unfair. My sole object, without party considerations, is to improve the conditions of the air service.

Mr. Tennant: If my hon. friend takes exception, let me say not a stick to beat the Government, but arguments and statements made for the encouragement of the Government. At any rate, I do not think that we ought to encourage statements from people who are in the service of the Crown.

One statement made by the hon. gentleman to which I take exception is that the mobile guns have not been adopted by the Government. He is quite misinformed if he thinks that is so. I can state, however, in regard to guns and gunners, that we have established a school of gunnery for officers, with a special course of instruction. We have various types of guns in use, and men are trained on guns which they will use.

As to the command of the air, we have machines of every kind. I do not know exactly what the hon. gentleman means when he uses the phrase, "the supremacy of Great Britain in the air." If he means that no German machine shall be allowed to go up into the air at all, I think he is asking for a very great deal.

Mr. Joynson-Hicks: I mean in regard to the air exactly what everybody means by the supremacy of the British Navy on the seas.

Mr. Tennant: I do say that it is very far from the truth to state that the Germans have got the supremacy of the air. I believe that we have a very large measure of supremacy of the air, and that in the great majority of combats which take place in the air we are the winners.

As for reconnaissance and wireless, we do an infinite amount more reconnaissance work than the Germans have ever done in spotting artillery. I am informed that we have at the present moment two types of aeroplanes faster than anything possessed by the Germans—and we have two other types as fast as their fastest.

Continuing, Mr. Tennant said that, with regard to landing-grounds, a complaint had been made that we had not a sufficient number of landing-grounds for night flying. That defect, if it were a defect, had been remedied.

I cannot pass in silence, Mr. Tennant proceeded, the correspondence in relation to the Air Commission. Mr. Billing, on whose charges I asked the Prime Minister to set up a Committee of Inquiry, declines to give evidence. The first ground is that the Committee does not include an inquiry into the Royal Naval Air Service. Secondly, the composition of the Committee of Inquiry. Thirdly, because, I think, he was not consulted as to the composition of the Committee and as to the gentlemen who were asked to serve upon it. Fourthly, because it proposes that some parts of the evidence should not be given to the public.

In regard to the composition of the Committee I am responsible, and if anybody has any ground for complaint let them lay it upon me. I said at the time that I would set up a small judicial body to investigate certain charges of murder. I have done my best to obtain the most reliable gentlemen accustomed to sift evidence, to be helped and guided in mechanical engineering and technical difficulties by two engineers of great experience and great ability, and I cannot see how it would be possible to improve the composition of that Committee.

Mr. Billing: Quite easily. You should have consulted the House.

Mr. Tennant, proceeding, said the Fokker machine which was captured not very long ago was a new machine. It had been tried by our own airmen, one of whom reported that the speed of the machine was practically the same as that of an 80-h.p. Morane scout with deflector propeller, that the decline was not nearly so fast, and that the fore and aft control was distinctly bad. It was also said that it was a difficult machine on which to teach pupils to fly.

NEW AIR BOARD

Dealing with the composition of the Committee, Mr. Tennant said that pilots who were now engaged in the fighting services ought not to be taken away from those important duties, and it would not be in accordance with our ideas of what was correct in a matter of discipline that a junior officer should sit in judgment on his superior. The question whether all the proceedings of the Committee ought to be conducted in public or not was a matter for the chairman to decide.

It has been arranged, the right hon. gentleman proceeded, that an Air Board shall be constituted on the following lines:

The Board shall be composed of a President, who shall be a Cabinet Minister.

One naval representative, who shall either be a member of the Board of Admiralty or be present at its meetings when matters connected with the work of the Air Board are under discussion.

An additional naval representative, who need not always be the same individual.

A military representative who shall be a member of the Army Council; an additional military representative, who need not always be the same individual.

A member of independent administrative experience; and A Parliamentary representative of the other House from that in which the President sits.

The Board will be an advisory board in relation to its President. That is, its decisions will not be arrived at by voting.

The Board will be free to discuss matters of general policy in relation to the air, and, in particular, combined operations of the naval and

military air services and to make recommendations to the Admiralty and War Office thereon.

"The Board shall be free to discuss and make representations upon the types of machines required for the naval and military air services. If either the Admiralty or War Office decline to act upon the recommendations or the Board, the President shall be free to refer the question to the War Committee."

Sir E. Carson: Will he be bound to refer?

Mr. Tennant: Presumably he would not. The Board shall be charged with the task of organising and co-ordinating the supply of material and preventing competition between the two Services. The Board shall organise a complete system for the interchange of ideas on air problems between the two Services, and such related bodies as the Naval Board of Inventions, the Inventions Department of the Ministry of Munitions, the Advisory Committee on Aeronautics, the National Physical Laboratory, &c. The Board shall have a secretary to assist in the conduct of the business brought before them.

Colonel Churchill: Suppose the Air Board wish to order 1,000 machines of a particular type, of which the Admiralty or the War Office do not approve, have the Board the power to do it, or have they not?

Mr. Tennant: If there is disagreement, the decision would rest with the War Committee. The War Committee would give instructions through the Ministry of Munitions if they thought fit.

Colonel Churchill: So they have no executive power apart from agreement with the two departments, with the authority of the War Committee?

Mr. Tennant: Yes. The Prime Minister has invited Lord Curzon to accept the presidency of this Board, and Lord Curzon has accepted that office. Lord Sydenham has also accepted an invitation to become a member of the Board. The hon. member for Rugby (Mr. J. L. Baird) will represent the Board in this House.

I hope the House will realise that this is quite a different proposal from what was suggested by Mr. Joynson-Hicks in his speech. This is not a method of finding a way out. It is a real Board, accessible to the War Committee, with responsible powers, consisting of responsible persons, and with far greater power than any Committee hitherto created to deal with the air service. The old Committee was confined to questions of material, and this Board will have powers of a much more important and powerful body.

"They will not only have the powers which I have read out, but they will charge themselves with the larger and wider questions of thinking out the possibilities of their own body, possibly that of a regular department under it—what is called an Air Ministry."

It has been thought that during the process of a great war, when the difficulties were so great, the dislocation in the setting up of an Air Ministry now would be too great for us to embark on it.

COLONEL CHURCHILL'S SPEECH

Colonel Churchill: The House will have heard with some feelings of disappointment the announcement that has been made. After the many months that this matter has been under discussion and the postponements of bringing it before the House, we had hoped that a real effort towards a solution would have been set forth in the Government statement. In the choice of a man no doubt the Government is well advised. The air services have long needed the guidance and aid of some personality of first-rate eminence, versed in public affairs, and of adequate influence in the Cabinet. This they will find in Lord Curzon, but Lord Curzon without adequate powers will not succeed in altering the present state of affairs.

In the choice of a policy the Government have followed no principle whatever except the familiar principle of postponement until the last possible moment, and then following the line of least resistance.

I urge the House not to commit themselves to the acceptance of the proposal without a full opportunity of studying it. I wish to clear out of the way some points of a general character upon which misconception has long existed. I have never yet had an opportunity of addressing the House on the air and the air policy with which I am much concerned and for which I am continually criticised. In the first place we have never had a plain statement of how it was that the Admiralty came to be responsible for the aerial home defence, and I have always wondered how the First Lord of the Admiralty has never made such a statement.

It is commonly supposed that the Admiralty, at a more or less distant period before the war, under my impulsion rushed into the business of home defence, snatched it away from the proper authorities, and then mismanaged or neglected it. This is not the truth. The contrary is the truth. Until a month after the war had begun the sole responsibility for the defence of all vulnerable points in England by gunfire, seaplanes, or any other method against aerial attack rested with the War Office. The only exception to this was that at a conference between heads of the War Office and the Admiralty on November 19, 1913, it was agreed that where a vulnerable point was in close proximity to a naval air station the naval aeroplanes would also be available. But even this position was challenged by the General Staff as late as July 21, 1914—that is to say, on the very eve of the war, though we had not any reason to expect an immediate outbreak.

On that date a meeting took place of a committee appointed to regulate the relations of naval and military aeroplane and seaplane bases. At that meeting the representative of the War Office—the War Office was then in charge of the present Prime Minister—claimed for the War Office the sole responsibility, not only in regard to everything inland, but in regard to naval ports and vulnerable points of all kinds, even though of exclusively naval interest.

"Notwithstanding these views, which in principle are quite sound so far as the integrity of home defence is concerned, the War Office had not up to the time of the declaration of war provided any aeroplanes for home defence."

They had limited themselves exclusively, and as a matter of prior urgency, to the development of the expeditionary squadron, and on the outbreak of war practically all the Army aeroplanes were sent abroad. I do not say they were wrong in this at all. The despatch of the squadron to the Expeditionary Army was a matter of vital urgency, but the consequence followed. Not only were there no aeroplanes available for guarding the vulnerable points, but none could be found even for the temporary purpose of watching this coast during the passage of the Army to the Continent. The guns which were available then were almost laughable. They were, I think, five service guns and a small number of quite useless pom-poms. It is necessary to refer to the extraordinary difficulties before the war of getting money for aerial defence. The Navy and the Army are old and powerful institutions, and the demands of those two established Services are embodied in large institutions and establishments which must have full activity and which must be maintained by Parliament whatever its passing mood may be. Nevertheless, the Admiralty in the years before the war had to fight continually to secure the necessary increase, and the Army was hard put to it even to hold its own.

When General Seely and I went, in 1911 and in 1912 respectively, to the War Office and the Admiralty the military wing was in its early infancy, and the Naval Air Service was represented by half a dozen aeroplanes and pilots, and the debris of the airship *Mayfly*, which had just broken its back.

It is pitiful and ludicrous to look back now upon the shifts to which we were put to obtain the necessary money for the air, and it was out of the difficulties of getting the money that the duality originally largely arose. It is always easier for the Navy to get money than for the Army. Our estimates were enormous and increasing, and a hundred thousand pounds more or less escaped the severe scrutiny which the Army estimates suffered from. I began as early as 1912 to develop the aeroplane service outside our normal Admiralty sphere, in order to supplement from another set of Votes the inadequate credits which the War Office succeeded in obtaining. Of course, we see now the evils of duality, but at that time the object was to get as large as possible an amount of material and number of airmen into existence in the time available. The naval authorities, although always rather reluctant to add to the ordinary demands of the Navy Estimates, were increasingly anxious about the undefended state of dockyards and naval vulnerable points, and thus almost clandestinely was built up at the Admiralty an aeroplane service of our own, which, when the war broke out so suddenly and so unexpectedly, had already attained respectable dimensions.

It was well that we did this. At the outbreak of the war the whole of the War Office went off to the war, taking the whole of their aeroplanes with them, and nothing remained in this country but the Naval Air Service. A month after the war had begun Lord Kitchener asked me whether the Admiralty would undertake the general duty of home defence against aerial attack. He pointed out that all his efforts were concentrated on the equipment and maintenance of the expeditionary squadrons, and that he had practically no resources in guns or aeroplanes for home defence. The Admiralty, on the other hand, had a considerable supply, with which, in fact, though without formal authority, we were already guarding the vulnerable points of special interest to the Navy. In the circumstances I thought it my duty to comply, but I was careful immediately to define on behalf of the Admiralty the limits within which we would accept responsibility.

I therefore drew up a printed memorandum, in which I set out the total resources we could spare without prejudice to the paramount needs of the Fleet. I pointed out that those resources were wholly inadequate and unsuitable, but I undertook to do the best we could with them, and to take the necessary steps to increase them as soon as possible. I carefully stated that the Admiralty could not be responsible for home defence, but could only be responsible for doing the best possible with the material available. On this basis, which was formally accepted by the Government, the Admiralty undertook, very reluctantly for the most part, the thankless and, as it seemed then, almost hopeless task for the time being.

"Our available guns and aeroplanes were forthwith disposed to what we considered the best possible advantage, and overseas bases in France and in Flanders were established, and those have proved an effective and almost absolute barrier to the attack of German armed Zeppelins coming from Belgium and the Rhine."

The series of offensive enterprises against the Zeppelin sheds began, and on this quest, despite their slender resources, the naval arm went to Dusseldorf, to Cologne, and Friedrichshafen, and even to Cuxhaven, in the North Sea. Six Zeppelins, it is said, were destroyed either in the air or in their sheds by a handful of naval pilots, acting, as the First Lord of the Admiralty would now call it, "outside their normal sphere." Within a few weeks of the Admiralty becoming responsible very large orders were placed for aerial guns and the proper kind of munition for aerial searchlights, and immense orders were distributed for aeroplanes to the utmost productive limit of every aircraft factory in any part of the world not already occupied with Army work. None of those orders matured during my tenure of office, but they all must have come to hand many months ago. Such were the circumstances in which the Admiralty became responsible for home defence, and the manner in which we endeavoured to discharge that responsibility.

The story which I have outlined acquires deeper significance when the general conditions of aerial warfare are considered. Mr. Joynson-Hicks has twitted me this afternoon with my phrase about hornets. I am very glad to come to the hornets. The main defence of England against Zeppelins has consisted since the war began in the formidable swarm of hornets of which I spoke in 1913—that is to say, aeroplanes with skilful pilots are held ready with bombs and guns to attack any Zeppelin which approaches our shores.

"This defence has been effective up to date in preventing any attack by Zeppelins coming here by daylight, or even by moonlight. Thus for the whole of every day and for a large proportion of the hours of darkness complete protection has hitherto been afforded. It was hoped that even in the dark nights the aeroplanes would be able to act effectively against Zeppelins. This hope has not been realised. Not because the aeroplanes cannot fly at night, not because the aeroplane is not fully a match for the Zeppelin, once the encounter is joined, not because properly lighted landing grounds cannot be arranged, but because it has proved very difficult indeed, and almost impossible, to find the Zeppelin in the dark.

But apart from this, and this is a very important exception, apart from this exception the conclusions which I stated to Parliament in a perhaps dangerously picturesque form have been justified. They are no more vitiated by the occasional raids which have taken place in the dark hours than the strategic conclusions which fix the war station of the Fleet have been vitiated by the occasional chance raids which take place from time to time on our Eastern coast. Twenty-five or thirty days during the whole of these twenty-two months of war Zeppelins have raided our shores, and it is to the presence of aeroplanes at the outset entirely provided by the naval wing, in the absence of Army machines abroad, that the immunity from Zeppelin attack which Britain has enjoyed on the other 600 days and nights is almost exclusively due.

But for the aeroplane service we had created before the war, there would have been nothing to stop Zeppelins from raiding us every fine day, and if they were able to come in daylight they would be able to find their way with certainty to the vital and vulnerable military points, to our arsenals, to our magazines, to our oil tanks, to our dock-yards, to our munition works, and to drop their bombs with accuracy and deliberation from altitudes beyond reach of any anti-aircraft gun which at any rate existed during the first year of the war.

Our aeroplanes have restricted Zeppelin attacks to a few nights in certain months, and even then those attacks can only be delivered almost blindfold. The proof of the triumph of the aeroplane is that after twenty-two months of war no object of any military or naval importance among the thousands which exist scattered broadcast throughout the country has yet been struck by any Zeppelin bomb. In fact, from the purely military point of view, the aeroplane defence has so far proved absolute. Even as regards the civil population it has been, and is now, effective for 95 per cent. of the time. This truth is incontrovertible.

The second defensive method against Zeppelins is the fire of guns. Within its restricted area, and to a limited degree, this method also had proved effective, but the fire of guns cannot be generally available. Important military points can be so defended, and even, perhaps, London itself has been to some extent protected by guns, but the whole country cannot be protected by guns, even by mobile guns.

"It would, indeed, be a serious danger if the Government were induced by clamour to use anti-aircraft guns for the defence of vague residential or industrial areas."

They should be strictly confined to defending points of special importance, and no undue demands must be made which would divert or dissipate our resources in this respect. I hope the House will make the Government feel that they will find in the House of Commons effective support against any reasonless clamour, however natural it may be, as long as they are shown to be adhering to the sound lines of military thought and action.

I wish to refer to the question of British airship construction. Before the war, the policy of the Admiralty was to build airships both rigid and non-rigid, only for training and experimental purposes. We wished to keep abreast of and be informed about the development of airships. We wished to have practical experience of them. We wished to have a nucleus both of personnel and of material, which could, if necessary, as the development of the art shows need, be expanded and elaborated. But we did not attempt to rival Germany in this sphere, or to build fleets of airships on which we should rely to play an effective part in our system of naval defence. On the contrary, we looked to the aeroplanes, and the seaplanes operating from the shore or from ships, to afford us our old characteristic effective counter-measure.

The teaching of nearly two years of war has not proved that view in the main to be unsound.

Up to the end of 1913 the Army also had an airship establishment, consisting of a handful of competent officers and three or four little field airships. Although our naval airship service was purely experimental, its scale was much larger than that of the Army, and had already amounted, I think, to ten or a dozen airships of various types, some quite large, built, building, or projected. It was decided, I think in January, 1914, in the interests alike of economy and efficiency, that the airship service should be unified and be a purely naval service. No responsible officer at the War Office, or at the Admiralty, whom I ever met before the war, anticipated that Zeppelins would be used to drop bombs indiscriminately on undefended towns and the countryside.

GERMANY'S FORM OF ATTACK

This was not because of any extravagant belief in human virtue in general, or in German virtue in particular, but because it is reasonable to assume that your enemy will be governed by good sense and by a lively regard for his own interests. What more mischievous policy in her own interest could Germany have pursued than to infuriate large populations against her without being able to injure their war-making capacity? But even if the military authorities responsible for home defence had known beforehand that this form of attack was going to be made by German Zeppelins, it is not clear to me what

preparation they could have made which would have guaranteed absolute immunity to the general public.

A fleet of British Zeppelins, for instance, would be no such guarantee. The area open to attack is so large and so various that the assailant would always be able to arrive at the selected point in superior force. All he seeks to do is to drop bombs through the blue upon wide inhabited areas and then escape. The defending airships, on the other hand, would have a very different task—namely, to concentrate on any point in superior force, and then to find, catch, and bring to battle a few dark shapes swiftly moving through the clouds and mist with a free choice of direction and flight. The invaders would aim at a stationary and located target measured in hundreds of miles. The defending airships would have to aim at a moving and uncertain target measured in hundreds of feet. But who would pretend that it was in our power, even if we had the funds, say, in 1912, to create a Zeppelin fleet approaching in quality or numbers the German Zeppelin fleet—the product of ten years' expense and experiment on the most lavish scale. Even if any Government had entertained the project—even if any Parliament had voted the funds necessary—we could not have hoped to compete with Germany successfully in rigid airships in the time available.

Our attempts to build experimental machines have been baulked until some months after the beginning of the war by continuous delay and disappointment. Nearly 100 aeroplanes and their sheds can be obtained for the price of one Zeppelin and its shed. What folly it would have been for us to have squandered the hard-earned, grudging, and exiguous money which had been secured for air defence on Zeppelins—fewer in number, inferior in type, and certainly ineffective for the purpose of the defence of a civil population from Zeppelin raids. What would our situation have been at the sudden outbreak of war if we had been found with a handful of these frail, feeble monsters so easily broken by the accident of weather, instead of with an Army Aeroplane Service out of which the immense expansion of the present time has been developed, or a naval wing which in the emergency guarded securely every vital point in our islands, setting the military free to go abroad.

We should indeed have thrown away the substance for the shadow. We are all certain nowadays with that kind of wisdom which comes after the event, but I do not in the least shrink from applying that unfair test to the policy pursued by the Admiralty and the War Office, partly under my responsibility, and with my full agreement, in regard to the building of a Zeppelin fleet before the war. Suppose by the stroke of a wand we could step back with full knowledge to the year 1912, and suppose that the £8,000,000 or £10,000,000 necessary to establish a good Zeppelin fleet were placed at our disposal as an addition to the ordinary Estimates which were in fact voted—should we be wise to build one? Is it not clear that even if we are going to use the light of our present knowledge on the decisions which should have been taken before the war, a great many other competing things would have had to be considered before we came to the question of spending £10,000,000 on Zeppelins? Are we quite sure after twenty-two months of war that the Germans themselves might not have made a more formidable investment of the large sums of money than that which they have done on their Zeppelins? At any rate, the story is not yet finished. Events unfold from day to day, and I for my part am quite content to await the final judgment which will be passed on these matters when the war can be surveyed in retrospect as a whole.

REMEDY FOR RAIDS

The true remedy and the only radical cure for Zeppelin raids are either to attack the German Zeppelins in their sheds with aeroplanes, or to station squadrons of aeroplanes at some point or points overseas where they can intercept the German Zeppelins during daylight, either going or returning. The second policy was adopted with complete success in September, 1914, by the Admiralty, so far as the German army airships, coming from the Rhine or from Belgium, were concerned, by the establishment of our naval stations in France and Flanders. As to attacks on Zeppelin sheds, I can only repeat what I said three months ago—why have they been discontinued? Why has it not been possible to construct the special types of machines that may be required for each particular objective? This has a great bearing upon the proposal which the Government has just put before us. In my opinion, the reason is that this subject has not been studied in the last year from a commanding point of view by anyone who was able to give his whole time and attention to it. No doubt the difficulties have increased, and the enemy's means of defence are continually improving. All the more condemnation to you for losing so much valuable time and, perhaps, for letting precious opportunities slip by.

But there are two other forms of Zeppelin activity which must be considered. They are purely naval in their character. It is absurd to suppose that the Germans are not fully alive to the obvious uses of these Zeppelins which they have made their speciality. It is important that we should be alive to the counter-measures which are necessary, and which are within practical reach.

First of all, there is the unrivalled power of the Zeppelins for long reconnaissances at sea. I agree with the First Lord of the Admiralty in wishing that we had been provided at the outset with a certain number of rigid airships and sheds, which could have supplemented and aided the control exercised so well by our squadrons and flotillas. The repeated failures and disappointments in regard to the construction of these vessels was one of the reasons why we had none of them available at the outbreak of the war.

"I do not quarrel at all with any efforts which the First Lord may make in the direction of supplying this want now that money is no longer an object. Whether any good result will be achieved will depend, of course, on the length of the war; but I urge the representatives of

the Admiralty here not to delay on that account the energetic development on a great scale of seaplanes, and especially aeroplanes, operating from ships specially adapted or from the existing warships. This is the policy which was our original policy, and it would have provided, and will still provide, a very good substitute almost immediately obtainable even for reconnaissances."

It is still more true in regard to the second possibility of Zeppelin action—namely, the observation of falling shot in the long-range stages of naval action. It may be well argued that this can be done more accurately from a great height than from the masts of ships. This raises an important consideration. If you have developed the use of the fast aeroplane at sea and the launching of these from the decks of warships, and the picking up of them afterwards by other vessels, then it will be possible to drive away all the Zeppelins from the neighbourhood of our fleets which are in movement or action, and to destroy any that attempt to approach them. But if, on the other hand, you neglected this obvious improvement, or only developed it half-heartedly, and contented yourselves with bewailing the absence of rigid airships of your own, then serious and preventable disadvantages would be incurred—disadvantages which, however, I am bound to state ought not in any circumstances to make a decisive difference, having regard to our margin of superiority. Still, these disadvantages ought to be remedied at the earliest possible moment.

The controversy in these matters proceeds so frequently on wrong lines and at cross-purposes. Take, for instance, the case of the Committee which has been appointed to examine into the charges of Mr. Billing. He made a speech in this House, and in it he used the word "murder." But, as a matter of fact, the hon. gentleman so far as I can gather was leading the Government to suppose that what was needed was an increase in the factor of safety in the machines.

I have met many persons of great competence on this subject who think one of the mistakes we made at the beginning of the war was in not immediately reducing the factor of safety. You may make a perfectly safe machine which the enemy can certainly hunt down and out-manoeuvre. Peace time risks in aviation naturally tended to the reinforcement of the factors of safety because people were shocked at the accidents which took place, but when the war began other dangers far more terrible than the incidence of ordinary breaking strain and the occurrence of accidents supervened. I have heard that there is a great deal to be said for relaxation of the factors of safety in constructing machines in order to get speed and climbing power, which will save the life of a pilot in a hard fight.

The difficulties from which our air organisations suffer arise from two causes, first of all the duality of effort and of organisation, and the friction resulting therefrom. I have explained to the House how it was that the two services started in the early days. That friction and want of co-ordination have resulted, and on a greater scale as the scale of operations increased, cannot be denied. Shortly after I left the Admiralty the resolve was made to navalise the naval wing from top to bottom, although it was almost entirely staffed by young civilian privates. But in the pursuit of this general policy of navalisation the speedometers in the machines by which the rate of flight was regulated and the position of the aeroplane located were all converted from speedometers in miles to speedometers in knots. The result in France and Flanders, where we have numbers of aeroplanes continually flying, was that, while the speedometers were in knots, the maps which the men were using were in miles or kilometres, and the naval pilot with perhaps a Fokker machine in the air above him and bursting shells below him had to go through a careful and elaborate and difficult calculation to convert the miles into knots or back again to verify his position. That is a typical instance of hundreds of small points of petty friction arising from the undue particularism which we had hoped the Government would make proposals to finally remedy. The second and the more serious difficulty of the system was the lack of any commanding initiative in design and overriding authority in affairs of the air. Neither of these difficulties will be remedied by the proposals which have now been made by the Under-Secretary so far as I understand them; they seem to be a mere attempt to parry the demand for an Air Ministry by setting up another advisory committee with Lord Curzon at its head instead of Lord Derby.

The members of this Board may advise the President, but he need not take their advice. The President may advise the Admiralty and the War Office, but they need not take his advice, whether it is what you may call advised advice or unadvised advice. Then we are told that the Board is free—free like the rest of us, like the hon. member of East Herts "to discuss matters of general policy in relation to the air, and to interchange ideas." If their advice, their suggestions, their recommendations, etc., bear no fruit with the two fighting departments, who after all are busy carrying on the war and apt to give rough answers to these matters, then the President may complain to the War Council.

On a difference of this character arising they will be supported, of course, by the whole mass and weight of their two respective departments, headed, no doubt, by the representative of the Air Board of each department. That does not seem to me to amount to very much of a forward step. It would, I suppose, have been open to Lord Curzon as a Cabinet Minister to discuss questions of general policy in relation to the air and even to interchange ideas upon it, to make suggestions about these matters, to raise them in the Cabinet, and to persuade the Cabinet to take decision upon them or even to refer them to the War Council. Even without any action by Lord Curzon it would have been possible for the Secretary for War and the First Lord of the Admiralty to come together and arrange a common policy for the settlement of these differences or to have set up, if necessary, an inter-departmental Committee to adjust the points of friction between the two services and prevent overlapping in the purchase of machines. Such a Committee, with the goodwill

of the departmental chiefs, would, I am sure, achieve far more than any outside body with doubtful powers and with a critical faculty.

I know the military departments of this country well, and I know what their attitude is towards a body which has the opportunity to inquire, to criticise, to offer advice, and to make complaint, but has not the right and the power to exact obedience. Either the arrangements now proposed will lead to nothing effective, which will be the case if Lord Curzon shows the great qualities of tact which are likely to be required from the holder of the office which is to be created, or, which is more likely, will lead to a first-class row. If he is going to make his work a reality it is perfectly clear that very grave differences and much friction—friction which you have been unable to overcome yourselves in making the proposals—will immediately be created. In both cases it will lead to delay in arriving at a proper organisation and a wholehearted policy. Can anyone feel that the proposals are put forward by the Government in the sincere belief that they will really open the way for the conquest of aerial supremacy for this country? I cannot think it difficult either to devise a unified organisation or to divide on natural and well-marked lines the services, of training and supply on the one hand, from the tactical employment of units afloat and in the field on the other. I proposed to the Prime Minister a scheme on these lines only a year ago.

Complete amalgamation may not be possible at a single stroke, but the formation of an Air Department, with real responsibilities and powers, is an urgent and indispensable preliminary.

No one can doubt that ultimately, and the sooner the better, the air service should be one unified permanent branch of Imperial defence, composed exclusively of men who will not think of themselves as soldiers, sailors, and individuals, but as airmen and servants of an arm which possibly at no distant date may be the dominating arm of war. Let the House remember how vital this matter is.

I agree entirely with what was said by Mr. Joynson-Hicks that complete, indisputable supremacy in the air world gives an overwhelming advantage to the artillery of the armies that enjoyed it. You have not got, in spite of what the right hon. gentleman has said, that complete supremacy now. You have not even got equality. On the contrary, in many respects the Germans have the advantage, and you have lost the superiority which at the outbreak of war it was admitted that you possessed. But you can recover it. At sea the increasing power of the defensive in mines and submarines has largely robbed the stronger Navy of its rights. On land we are in the position of having lost our ground before the modern defensive was thoroughly understood and having to win it back when the defensive has been elevated to a fine art. But the air is free and open. There are no entrenchments there. It is equal for attack or defence. It is open to all comers. The resources of the whole world are at our disposal. Nothing stands in the way of our attaining aerial supremacy in this war but yourselves. There is no reason, and there can be no excuse, for failure to obtain that aerial supremacy, which is, perhaps, the most obvious and most practical step towards a victorious issue from the increasing dangers of this war.

LORD HUGH CECIL

Lord H. Cecil said that in a fight during the day there was no question as to the superiority of the aeroplane over the Zeppelin, but at night it was unwise to use aeroplanes against Zeppelins, and the safety of this kingdom must depend on anti-aircraft guns.

He was for three months twenty-five miles behind the British lines, and he never saw a German aeroplane, except one that had been captured. On the other hand, if a person had been twenty-five miles behind the German lines he would have seen an abundance of British aeroplanes engaged in long reconnaissances.

When he first went to Netheravon as a pupil on January 1, 1915, there were a number of machines there which were the fashionable machines of the hour. Yet not one of those machines was in use when he went out to France in September of that year. It was extraordinarily difficult when people were making improvements at that rate to judge at what point they should put in their large order.

The unhappy accidents which took place were due to mistakes of the aviators or to defective apparatus. The apparatus was as trustworthy as it could be made. In no case did any responsibility lie with the central authority at headquarters, but the conception that the higher officers of the Flying Corps were indifferent to the loss of gallant lives was a mistake so flagrant that if the matter were not a very serious one it would be ludicrous. The conditions of our Royal Flying Corps would compare favourably with the conditions of any Flying Corps in the world, and nothing could be more inspiring to the imagination or more touching to the heart than those thrilling dramas which were played without spectators, when combats took place between one pilot and another, travelling at a speed of eighty or ninety miles an hour many thousands of feet up in the air.

Mr. Bonar Law: The Prime Minister has asked me, as a member of the War Council, which is responsible for the decisions the Government have taken in this matter, to take part in this debate. My chief purpose is to give the House the reasons—and we thought they were weighty reasons—that brought us to the conclusion that, on the whole, the plan on which we had decided was the best. As to the criticism of our air service generally, on the last debate I said that, after the examination I had given to the subject, the conclusion to which I came was that the service was infinitely better than I expected. That impression remains on my mind now more strongly than ever, and I think it is confirmed by the incidents referred to by Colonel Churchill. He showed very clearly that in dealing with Mr. Billing, he was in a difficulty. Mr. Billing told us not of the nights on which the Zeppelins came, but of the other 360 nights on which they did not come, and, in justifying his own previous methods in dealing with them, he laid down the very satisfactory doctrine to him, that his

strategy was not in the least proved to be wrong. That may be an explanation, but it was not the kind of attack which has been made on the Government. As regards the inquiry, Colonel Churchill said something with which I do not agree.

What was the Government's justification for granting the Commission? It was that a member of this House, with all the responsibility of being a member of this House, made charges, not using the words in a loose sense, which implied that the men in charge of this service, and at the head of it, were through criminal indifference and negligence and incapacity killing men.

That kind of charge can be made in this House as everybody knows without the possibility of answering it. You cannot go into the details. The hon. member was offered the opportunity of going before a divisional tribunal, which would be trusted, I venture to say, by every business man in the country or in this House. But the hon. gentleman declines to proceed further. Perhaps he is right. That depends entirely on the badness of his case, but I must say for myself—I cannot judge as well as he—it must be a very bad case indeed if it would not be in a better position after going before that court than it is now.

In judging as to the quality of our air service, it all depends on the standard you set up. If what anyone has in his mind is the best possible service under the best conditions we could have, then obviously our service leaves a great deal to be desired. But if the standard is a comparison either with our enemy, or with any of our Allies, then I am prepared to say that our service is unquestionably far better than that of the enemy, and, as I believe, equal—I believe it is more than equal—to that of any of the combatants engaged in the war.

From the beginning of the war we had a great superiority in the air. That has continued down to the present moment, but at the end of last year, or the beginning of this year, our airmen, for the first time, having hitherto made reconnaissances with comparative impunity, hardly ever being attacked, suddenly found that these Fokker machines were waiting for them, and we had heavy casualties. It is perfectly true that the men who were doing reconnaissance work were on inferior machines to the best German machines. They had never been accustomed to being attacked, and, though it is not the intention of those who direct the air service that men on that kind of machine should fight, yet you could not prevent them fighting. They tucked up their wireless and went for the enemy wherever they found him. The result was that we had a considerable number of casualties, but there never was a time in this war when the Germans had a machine which was better than the best of our machines, and when they had not a machine which was not worse than the worst of ours.

“Now reconnaissance work is done by us with a frequency and regularity of success which is not even attempted by the Germans.”

The truth is, our aeroplanes cross the German lines oftener than they cross ours. I have had taken out a return of all those combats of which my noble friend spoke just now which took place between April 7 and May 4. Of course there were many casualties that were not the result of real combats. In this period of these contests there were 478. Of these sixty-three only took place on the British side of the line, and in these thirteen German machines were brought down and not a single British machine at all. Of course, we lost in fights on the other side of the line, and over the trenches, a large number of machines and men. But we do not know what the enemy lost. These figures, I think, clearly show the truth of the statement I made that we do use the air service for military purposes to a far greater extent than the enemy.

The next charge made against us was in connection with the machines. It is obvious to anyone, if you compare one type of machine with an entirely different type, it is easy to make out a case that we are entirely outclassed. That is what is being constantly done. This reconnaissance work is done with a slower machine, and in any case, even if you had fast machines, the fact that they have wireless and photographic apparatus makes it a necessity that they must be slower than the machines which are doing nothing but fighting. They talk about Fokker machines being superior to any of ours. That was absolutely untrue at the time it was made. We are not speaking now of the rate of speed in the air. Fokker machines have been captured, and one of them is being used regularly by our airmen.

“It is a fact, I am told—not only by the heads of the Air Service, but by independent authorities—that we have machines—a number of them, at least two types—which are distinctly superior from every point of view to the Fokker, and there are other types which are at least equal.”

GROWTH OF THE SERVICE

I should like further to say this—it would be well if the House could realise to what extent this service has grown. I cannot, obviously, give the figure, but I will point out two things. In the first place, to enable the service to grow, you have to have simultaneously aeroplanes, parts of engines, and mechanics and pilots.

“At the present time we are turning out every month a larger number of trained pilots than the total number that we had available from every source when the war broke out.”

It does not follow that we are perfectly satisfied, but the impression sedulously created that the air service has been muddled throughout is entirely wrong.

Now I come to my main subject, and that is the proposal put forth by the Government. We had three alternatives.

One was to do our best at development on the present lines. The second was to appoint a fully fledged Air Minister. The third was to establish a Joint Board.

We rejected the idea of leaving things as they are. As for the Air Ministry, Colonel Churchill said that the Government alone were standing in the way. I must say for myself, and I believe for the

whole Government, that we have no prejudice whatever against an Air Ministry. My right hon. friend is all in favour of an Air Ministry. Did that ever occur to him as a good thing when he was a member of the Government?

Colonel Churchill: I put a proposal of that character before the Prime Minister early in June last.

Mr. Bonar Law: Yes, but that was after my right hon. friend had left the Admiralty. If there was one man who, if an Air Ministry was the right thing, should have pushed it forward, that man was my right hon. friend. He would not have had the smallest difficulty in getting it carried out. There is more. When he was at the Admiralty there was a joint Committee of the two branches of the air service. He had one branch in his own hands and showed great energy in developing it in the best possible way, but instead of deciding that an Air Ministry was the right thing he gave a special name to the naval wing of the Royal Flying Corps, and his action tended to the segregation of the two flying services. Now everybody must understand that there are great objections to uprooting everything that has been done and establishing a new system in connection with the air service. The service would suffer for a time, and in this war we cannot allow it to suffer even for a time. I think some people believe that an Air Ministry would be analogous with the Ministry of Munitions. That is a mistake. The business of the Ministry of Munitions is to supply war material, but not to use it or direct the way in which it should be used. However you develop the air service the great bulk of its work will be done in connection with the Navy and the Army, and in the middle of this war it would surely not be wise to take away the training of air service men from the Army and the Navy.

Now let me deal with the kind of criticism which Colonel Churchill employed against the proposed Board. He pointed out that there would be no voting. The idea that the president will take one view and both the services will take a different view is an absurdity. What will happen very likely is that one service will take one view and the other service the other, and he will have to overrule.

Then you come to what my right hon. friend says about Lord Curzon being free to bring matters to the War Council. The powers given are those that the Board, which is a joint board of the two services—and that is the essence of it—with an outside chairman, who is a Cabinet Minister, shall be expected to go into all the air problems, and to make recommendations to the two services. If these recommendations are not carried out the president has a right of at once taking the matter to the War Council, who will come to a decision which will be final. It is quite obvious that if the two departments had made up their minds that they regard this as a fifth wheel to the coach, as something that ought not to be there, then this scheme cannot succeed. The essence of it is that the board in essentials represents the two services; and it has on it the men best qualified to speak for these services in their departments.

The next point of criticism made in the old days about allocating the machines is very important too. So long as it is the case, and it is to-day, that neither department can get as many machines as they want they struggle with each other to get them. That does not mean that there is ill-will between the two departments. Surely the obvious way of settling that is by having a board like this with an impartial arbiter.

This proposal has two great merits. It has the possibility—and, I hope, much more than that—of developing the service in a way in which it has never been developed before, and it does not interrupt the work which is going on now. It will speed it up and make it better than it is at the present moment.

I cannot imagine any office under the Government which I would be less willing to take than the post which Lord Curzon has accepted. I do not think I am asking too much of the House or the country to say that they recognise these facts and give him their goodwill in starting on the enterprise.

MR. BILLING

Mr. Billing regretted that the debate had taken a personal tone, and that the Under-Secretary for War had seen fit to refer to him in a very sneering and exceedingly unpleasant manner.

It has been suggested that either from cowardice or for some other reason he had refused to deal with the committee of inquiry. He did not want to deal with the committee; it had dealt with itself. Its fallacy was so obvious to any right-thinking man that there was no necessity in the public interest to discuss it. As to what the Treasury Bench thought—that did not trouble him a bit.

If the Government thought that they were going to side-track him and get him to dissipate his energies by appearing before this comic Committee of Legal Aunt Sallies they were very much mistaken.

As the hon. member continued his remarks members kept leaving the House by twos and threes, and shortly after eight o'clock the House was counted out.

HOUSE OF LORDS

May 16—*The Air Service at Gallipoli*—Lord Beresford asked if it was a fact that certain British and Australian military officers attached to the Royal Naval Air Service during the Gallipoli campaign were mentioned in despatches by their commanding officer and by the Vice-Admiral Commanding the Eastern Mediterranean Naval Forces, and that their names were omitted when those of the naval officers belonging to the same service and mentioned in the same despatches were published in March last.

The Duke of Devonshire said that the list of names sent by the Vice-Admiral was too large, judged by the scale generally adopted for other operations of the war. It was therefore returned to him to reconsider, and the list as gazetted was in accordance with his final recommendations.

THE AIR INQUIRY

The Committee appointed by the Government "to inquire into and report upon the administration and command of the Royal Flying Corps, with particular reference to the charges made both in Parliament and elsewhere against the officials and officers responsible for that administration and command, and to make any recommendations in relation thereto," met on May 18 to take evidence.

At the first sitting on Tuesday no one attended to give evidence, but this time several witnesses were present. General Henderson, commanding the Royal Flying Corps, was also present. The members of the Committee are Mr. Justice Bailhache (chairman), Mr. J. G. Butcher, K.C., M.P., Mr. Edward Shortt, K.C., Mr. J. H. Balfour Browne, K.C., Sir Charles Parsons, and Mr. Charles Bright.

The Secretary stated that replies had been received from Lord Beresford, Lord Montagu of Beaulieu, Lord Oranmore and Browne, and Mr. Joynson-Hicks, M.P., intimating their desire to give evidence. Replies had also been received from other persons, but nothing definite had been arranged in regard to the dates when they would attend.

The Chairman announced that General Sir H. Smith-Dorrien had been asked to join the Committee and he would do so, and would take his seat with them some day next week. He then called on Mr. Joynson-Hicks to give evidence.

MR. JOYNSON HICKS

This Committee, as I understand it, was set up with a view to the investigation of certain charges that have been made not by myself but by another member of Parliament. I am not working in concert with him, and I desire to make no observation on his charges. You wrote to me saying: "You have made certain charges against the Flying Service, and you will no doubt wish to avail yourself of the opportunity of giving evidence with regard to the allegations." With regard to allegations made against the Flying Service, I have looked through my speeches. I have looked through those speeches very carefully, and I have not noticed anything that may be regarded in the nature of allegations against the Air Service. I think you will find that the whole of my charges are of a political character against the political heads of departments, and that there is no reflection in any speech against any individual officer of the Flying Corps. In the speech of July 20 I said: "We want more aeroplanes; the Germans have more than we have." That is a statement I made on the authority of Mr. Lloyd George, and I think as a member of Parliament I am entitled to take the words of the Minister of Munitions. I go on to plead in my speech for a larger type of aeroplane. The Air Service has developed during the war, but the point is that it has been developed along the old lines—the lines of years ago—because there is not a man of sufficient energy to seize the possibilities that present themselves. Continuing, Mr. Joynson Hicks said it was quite possible to turn out more pilots than we were doing at the present time. He had heard from the front of a pilot who went out after six weeks' training, and who had had five hours' flying before going over. Though our men were so good, and so anxious, their number had always been the weak spot in the Service. There had also been great difficulty in getting sufficiently powerful engines. Another fault was that we had had to apply to the French Government for material, as mentioned by Lord French. He also asked who was responsible for the gunnery defences; and in January he complained of the see-sawing that was going on between the Army and Navy. There was in this no specific allegation against any specific individual. The Under-Secretary had said that aeroplanes could not be sent up merely by touching a button. What he said was that if an aeroplane were kept oiled and filled with petrol, and had a pilot, it would be as easy to send it up in 60 seconds as it would be to turn out a fire brigade in 60 seconds. As to flying grounds, he had said that they ought to have in the night time considerable places lighted with electric lights and ready in case of a raid. On Wednesday they were told in the House that efficient and properly lighted flying grounds had been provided.

Mr. Joynson-Hicks agreed that great improvements had taken place and more energy was being shown. Coming to the condition of affairs at the front, he alleged in his speech that we had not then the mastery of the air as we had been told we had, and he urged that we should have the same mastery of the air as we had of the sea. He suggested that the Government should appoint an Air Minister, and it was curious that the name he had in his mind was the man who had now been appointed—Lord Curzon. The speeches to which he had referred contained all the allegations he had made at any time during the past year, and these were founded upon correspondence and interviews he had had with manufacturers, flying men, Army men, and others. It was impossible for him to bring their evidence before the Committee. The letter he read to the House was from an officer serving at the front, a member of the House of Commons, and it was quite impossible to divulge his name. Throughout this controversy he had received confidences from a very large number of men in the Flying Service

and had given his word of honour not to mention names. He had never made a statement in the House of Commons without investigating it, and in nearly every case seeing the officer in question. A man well known to the Committee, a leading King's Counsel, spoke to him the other day about his son, but it was not possible to mention the name.

Mr. Balfour Browne: What was the nature of the allegation?

Mr. Joynson Hicks: It was an instance of a man flying in a machine who thought it was not sufficiently good for the purpose. The Committee would therefore see the difficulties he had to contend with, but he would like to add that he had brought no allegations against General Henderson, as head of the Flying Corps.

Replying to the Chairman, the witness said we had not got a machine which would keep up sufficiently long in order to fly to Dunkirk, or where the Zeppelin sheds were, and return home. His November speech about larger machines and greater power was made at the time when our machines were being beaten down by the Fokker machine. We had now got a machine which was equal to, if not better than, the Fokker, but it was common knowledge that there was a time when the Fokker had the upper hand. As to the mastery of the air, he had seen generals and others, and the general opinion was that we wanted more aeroplanes and stronger aeroplanes, and we wanted the mastery of the air as we had of the sea.

It was arranged that Mr. Joynson-Hicks should have an opportunity on Thursday next of going into details in regard to some of his statements, and that General Henderson should ask him some questions when he again gave evidence.

LORD BERESFORD

Lord Beresford was the next witness. Asked by the Chairman to go through his speeches in the same way as Mr. Joynson-Hicks had done, he said the reference did not enable him to go into his allegations against the Naval Flying Service. He did make certain allegations, but on inquiry among his brother officers he found the statements were not correct, and he took an early opportunity of making an explanation in the House of Lords and of expressing his regret that he made them. There were certain statements—he would not call them charges—that he made about the Air Service in the House of Lords on March 9 which it was possible to infer were directed against the military Department. He said he would propose that Zeppelins should be built as soon as possible, for the simple reason that in war machines, as in everything else, it was necessary to meet like with like, and he went on to assert that we had not the mastery of the air when Zeppelins could come here with impunity. His next point was not having an Air Minister.

The Chairman: Have you any specific charge to make against our early machines?

Lord Beresford: Yes; I think the whole of our early machines were entirely experimental, and the knowledge we have got by actual practical experience has made our people improve them enormously. They do the best they can with what the Government supplies to them, and it was creditable to our people that they did as well as they did. I do not think the Germans are very far ahead of us now.

General Henderson: When you say that the machines that were bought were nearly all bad machines, does that mean that we bought bad machines when we might have bought better?

Lord Beresford: We bought bad machines because we were short. We bought the best on the market, and we thought they were good; but by practical experience we found they were not good, and we made better ones. If we had had more experience I do not think we should have bought the large number we did.

MR. A. LYNCH

From time to time he had heard from pilots stories of general inefficiency, but he could not produce evidence, because the whole career of his informants would be risked if their names were given. One thing that he brought up months after the war began was the absence of range-finders, especially in London. Another was the want of encouragement on the part of the Government of new inventions. He mentioned the case of a Belgian engineer who spent money on a new aeroplane, and he tried to introduce it to the War Office authorities in London. When he did receive a communication it was after such a lapse of time that he had almost forgotten the matter. It was a curt communication declining the offer. He went on to complain that private firms were not encouraged as they should be, and he mentioned the case of a Surbiton firm who had written to him, and their story was fairly parallel to that of the Belgian engineer. This was a firm with great energy and new ideas, and yet it was ignored or snubbed.

In reference to the range-finder mentioned by the witness, General Henderson informed the Committee that the Royal Flying Corps had nothing to do with range-finders. As regarded the Surbiton firm which had been referred to, he intended to call one of the members of it on a future occasion.

The Committee adjourned.

The following are extracts from Mr. Billing's letter of May 16, declining to give evidence before the Committee according to their request:—

"I now beg formally to intimate that it is not my intention, as at present advised, to submit either myself or my evidence to the Committee. I have taken this decision for the following reasons:

"The terms of reference to the Committee have been carefully devised to rule out any inquiry into my allegations concerning the administration of the Naval Branch of the Royal Flying Corps. In my speech in the House of Commons on March 28 I substantiated what has been colloquially called my 'murder charges' by quoting a few of the many instances of what I contend to be avoidable loss of life. Several of the cases dealt with men of the Royal Naval Air Service.

"Therefore ostensibly to hold an inquiry into my charges which rules out my charges against the Royal Naval Air Service is a travesty of justice. In spite of these facts the First Lord of the Admiralty, I have been assured by the Prime Minister, refuses to have any inquiry into the administration and command of the Naval Branch of the Royal Flying Corps.

"If this were not sufficient reason for my refusing to accept this Committee as an adequate response to my demand for an inquiry, the constitution of the Committee would in itself justify the attitude I feel bound in the public interest to take up. This Committee, to be of any value, ought to be able to give an opinion on the evidence—necessarily largely technical—which should be

placed before it, and I contend that a committee composed of a judge, as chairman, with three legal gentlemen, a retired civil engineer, and a gentleman recognised only as an expert on steam turbines, is not the type of committee which could come to any useful conclusions on so technical a subject.

"Coupled with these two overmastering disabilities of the Committee, there is the injustice of refusing to allow a layman appearing before a body of lawyers to have the protection of counsel.

"Possibly the most disturbing statement made by you at to-day's abortive meeting was the whittling down of the promise of the Government that the inquiry should be held in public. This was 'the one bright spot' in connection with what I can only describe as the amazing procedure of the Government. Now, however, we are to understand that publicity is only to be given to such evidence as the Committee may decide to permit, and even its decisions are to be subject to any further suppression the Government may think fit to exercise through the medium of the Press Bureau. Therefore neither I nor any other witness before the Committee could be certain that at any time evidence regarded as vital to corroborate charges might not be suppressed 'in the interests of the public.'

"I think I have shown grounds which at least the public will appreciate why, alike in its constitution, terms of reference, and method of procedure (as revealed at to-day's sitting) this Committee must be entirely reconstituted and enlarged, if its findings are to carry the confidence of the Service or the respect of the country."

AIRCRAFT IN ACTION

OFFICIAL INFORMATION

ENGLAND

May 17—Albatros Wrecked near Lille—Yesterday (May 16) the fine weather favoured aerial activity, and 27 fights in the air took place. An Albatros was attacked, driven down, and wrecked near Lille. Another was driven down north of Vitry in a damaged condition. A third, attacked by one of our scouts, was seen to turn upside down near the ground. One of our reconnaissance machines failed to return. It was seen to land under control in hostile territory. One of our scout aeroplanes is also missing. A great deal of successful artillery and photographic work was accomplished.

(See German Official)

May 18—Thirteen Air Combats—Yesterday (May 17) there was again considerable aerial work. Thirteen combats took place. One hostile machine is believed to have been accounted for, as it was last seen descending vertically.

May 19—Hostile Machine Driven Down—In the air there was considerable activity. One hostile machine was driven down behind the German lines.

May 20—Raid on Kent—Issued by the Field Marshal Commanding-in-Chief Home Forces: A hostile air raid was carried out on the east coast of Kent last night (May 19) by at least three seaplanes. The raiders made the English coast at a few minutes past two this morning. One seaplane then turned north and dropped a dozen explosive bombs over the Isle of Thanet. Some windows were broken, otherwise there were no casualties and no other damage. The two other seaplanes seem to have turned south and dropped some twenty-five explosive bombs over South-eastern Kent. In one town a few bombs took effect, one soldier was killed, one woman and one seaman were injured. One public house was wrecked and several houses were damaged. The remaining bombs caused no casualties or damage. The raiders all made off as soon as their bombs had been discharged.

One raider (seaplane) was brought down by a naval patrol off the Belgian coast this morning (May 20).

[According to a report from Holland, the Hun in question fell into the sea, but the occupants were rescued.—ED.]

May 20—Two Hostile Machines Brought Down—Yesterday (May 19) the weather again favoured flying, and much successful work was done. There were thirteen combats in the air, in the course of which two hostile machines were brought down behind the enemy lines.

May 21—Three Hostile Machines Driven Down—Yesterday (May 20) our aeroplanes had several successful encounters with hostile aircraft. An Aviatik fell on fire into some trees near Dinifer Wood, in the enemy's lines, one of its occupants being seen to fall out. Another hostile machine fell in flames near Concalmaison, also in the enemy's lines, after an encounter with one of our scouts. A third crashed to earth in our lines near Maricourt. One of our aeroplanes fell in the enemy's lines. Early this morning a hostile machine landed undamaged in our lines. The pilot and observer are prisoners.

FRANCE

May 17—Raid by French Air Squadrons—During the night, May 16-17, 13 of our bombarding aeroplanes dropped 24 bombs on the German bivouacs in the region of Damvillersville, before Chaumont, 11 on the railway stations of Brioules and Clery, 14 on the cantonments at Nantillois and Romagne, and 21 on the station of Apremont and on Grandpré. Several fires were noticed. The same night another of our squadrons dropped 40 bombs on the aircraft sheds of Frescaty, 20 on the stations of Metz and Ars, 40 on the station of Arnaville, and 30 on

the railway lines and stations between Metz and Thionville. One of our pilots brought down a German machine to the north of Vic-sur-Aisne. The two wings of the enemy machine fell off during its fall. During to-day (May 17) one of our pilots, in an aerial fight, brought down a German aeroplane, which fell to the north-west of Rezonville. Another enemy aeroplane, riddled by the machine-gun fire of one of our machines, fell in the region of the Ban de Sapt. To-day one of our squadrons bombarded the station of Metz-Sablons, on which it dropped 25 heavy shells. In the region of Verdun the activity of the aviators was particularly marked, 33 actions being fought. Three German aeroplanes were brought down. All our machines returned safely. (All the places raided by the French squadrons are in the Verdun-Metz region.)

May 18—Bombs on Munitions Depot—During the night (May 17-18) enemy aeroplanes dropped several bombs in the region of Lunéville, Epinal, and Belfort, causing some unimportant damage to property. On the night of the 16th-17th our aeroplanes effected numerous bombardments on the front to the north of Verdun. Fifteen bombs of large calibre were dropped on an important munitions depot between Raucourt and Arrocourt, about six miles south of Sedan, five on the railway station of Sedan, where an outbreak of fire was noticed, and 15 on a munitions depot near Azannes. The same night (May 16-17) two of our machines dropped 24 bombs on the railway station of Metz-Sablons.

May 19—German Lines Bombed—Enemy aeroplanes last night (May 18) dropped three bombs on Gérardmer (in the Vosges), doing only slight material damage. A German aeroplane was brought down yesterday (May 18) by one of our pilots near St. Ménéhould. The enemy aviators were captured. Sub-Lieutenant Navarre brought down his tenth German aeroplane. The enemy machine fell and was smashed to pieces near Bolante, in the Argonne. During the night of May 18-19 our aeroplanes carried out numerous bombardment operations. The aerodrome of Morhange (in Lorraine), the stations of Metz-Sablons, Arnaville, Brioules, Stenay, Sedan, and Etain, and the bivouacs of Monfaucon and Azannes were bombarded with numerous projectiles.

May 20—Five German Machines Brought Down—Yesterday (May 19) Sub-Lieutenant Navarre brought down his eleventh German aeroplane. The machine fell in our lines at Chattancourt. The two enemy aviators were captured. During the day another German aeroplane, attacked by Sub-Lieutenant Jesser, fell and was dashed to pieces in the Forges Wood. This is the fifth aeroplane brought down by this pilot. Three other German aeroplanes which were fired upon by our machines with quick-firing guns were seen to fall vertically nose down in their own lines. Last night (May 19) some German aeroplanes dropped a large number of bombs on Dunkirk and Bergues. At Dunkirk a woman was killed and twenty-seven persons were injured. At Bergues there were five killed and eleven wounded. As a reprisal a French air squadron went up immediately to bombard the enemy cantonments at Wyfweg, Zarren and Handzaeme, while a Belgian squadron bombarded the aviation centre at Ghisteltes. The majority of the bombs found their mark.

(See German Official)

May 20—German Machine Brought Down—One of our motor guns brought down a German aeroplane in the region of Verdun.

May 21—Two Fokkers Forced Down—An enemy air raid in the region of Baccarat, Epinal and Vesoul caused only insignificant material damage. Four persons were slightly injured. During Saturday

night (May 20) our bombarding aeroplanes dropped numerous bombs on the military establishments at Thionville, Etain and Spincourt, and on the bivouacs in the region of Azannes and Damvillers. A bombardment of the shunting station of Lumes caused the precipitate departure of trains and an extensive conflagration among the station buildings. During an aerial combat between four of our machines and three Fokkers over the Forest of Bezanges, one of the enemy aeroplanes was brought down. Another Fokker, attacked by one of our pilots, was forced to come down in his own lines under the fire of our batteries, which destroyed the machine.

May 21—Bombardment of Dunkirk—The German aircraft have carried out two bombardments since yesterday (May 20). In the Dunkirk region some 20 bombs, dropped on the evening of May 20, killed four persons and injured 15 others. About noon to-day another enemy squadron dropped about 100 bombs on the suburbs of Dunkirk. Two soldiers and one child were killed and 20 persons injured. (See German official) Allied aeroplanes dispatched in pursuit of the enemy machines succeeded in bringing down two of them just as they were recrossing their lines. Directly after the first bombardment a fleet of 53 French, British and Belgian aircraft flew over the German encampments of Nyswege and Ghistelles, upon which 250 shells were dropped.

BELGIUM

May 21—German Aeroplane falls into the Sea—During an aerial combat off Nieuport a Belgian aviator, Captain Jacquet, and pilot, Lieutenant Robin, defeated a German aeroplane, which fell into the sea.

ITALY

May 16—Enemy Cantonments Bombarded—A raid by enemy aeroplanes upon places on the Lower Isonzo is reported to have taken place on the night of the 15th, upon Venice and Mestre the same evening, and upon Udine and Treviso at dawn on the 16th. There were few victims and the damage was very slight. A squadron of our Caproni aeroplanes at dawn this morning bombarded the railway station of Oveia Draga, and the enemy cantonments at Kostarievica, Lohvica, and Segeti on the Carso. Fifty bombs were thrown with very effective results. Our squadron, though the object of fire from many batteries and assailed by very many enemy aeroplanes, returned undamaged, after having brought down two enemy aeroplanes which fell in their territory near Gorizia.

(See Austrian Official)

May 17—Enemy Aircraft Active—Enemy aircraft dropped bombs on Castel Tesino, Ospedaletto, Monte Belluna, Stazione Della Carnia, and Gemona. Some persons were killed, but no damage was done. One of our air squadrons dropped bombs on Dellach and Kötschach in the Gail valley, causing fires there.

May 19—Enemy Parks Bombarded—Enemy aeroplane raids are reported at various points in the Venetian plain. We had altogether one killed and one wounded and some slight damage was done. Our aeroplanes bombarded enemy parks and camps in the Folgaria zone, returning unharmed, though having been exposed to the fire of numerous batteries.

May 20—Enemy Aircraft Driven Off—A big aerial raid was attempted by the enemy at daybreak yesterday (May 19) in the Venetian plain. There were slight casualties at Cividale and Morano, but almost no material damage was done. The enemy squadrons pushed on towards Udine and Casarsa, but were driven back by the prompt intervention of our aviators.

May 21—Enemy Aircraft Active—Enemy aircraft dropped some bombs on Vicenza, Valdagno, Feltre, and Fonzaso. Two persons were killed and four injured. The damage done was very slight.

EGYPT

May 19—Bombardment of El Arish—War Office statement: The General Officer Commanding-in-Chief in Egypt reports that our ships, aeroplanes and seaplanes successfully bombarded El Arish, an important post on the enemy line of communications from Syria to Egypt (35 miles west of the frontier) on the morning of May 18. The aerial attack was divided into two phases. The seaplanes opened the bombardment, being followed later by aeroplanes. The latter were given orders to engage any hostile machines, and to devote special attention to enemy troops and camp. A column of troops about 1,000 strong were seen south of the town on the march, and three bombs exploded amongst them. All camps were effectively bombarded. All ships and machines returned safely.

TURKEY

May 16—Bombs on Imbros—One of our seaplanes flew over the island of Imbros on the night of May 13 and successfully bombed two large enemy ships which were anchored in the bay of Kephalos. Our seaplane, despite the fire of the enemy artillery, returned undamaged. An enemy aeroplane appeared in the meantime and threw six bombs on the quay of Ourla, killing one man and two women of the civil population and wounding one child.

May 20—Enemy Aircraft Driven Off—Two enemy aeroplanes coming from Tenedos flew over the Dardanelles and were driven off by our fire.

AUSTRIA

May 15—Bombardment of Valona—Austrian Naval Staff report: "On Saturday afternoon" (May 13) "a squadron of seaplanes successfully bombarded the military works at Valona and on the Island of Saseno. They returned safely, in spite of a very heavy fire from anti-aircraft artillery."

May 16—Bombs on Hospitals—Early to-day enemy aviators dropped bombs on Kostanjevitza and on several hospital buildings, which were clearly marked, without doing any damage.

(See Italian Official)

May —Enemy Aeroplane Shot Down—In Southern Tyrol an enemy aeroplane was shot down.

May 17—Successful Raid on Udine—A strong squadron of our military and naval aeroplanes early yesterday morning (May 15 and May 16) and the night before bombarded the railway stations and other buildings of Venice, Mestre, Cormons, Cividale, Udine, and Treviso. Everywhere, especially at Udine, where some 30 enemy guns opened an unsuccessful fire, the great effect of our bombardment was observed.

May 20—Bombs on Seaplane Harbour—One of our naval air squadrons successfully bombarded the railway precincts at San Giorgia di Nogara and the enemy seaplane harbour near Grado.

May 21—Bombs on Railway Stations—Our aviators dropped bombs on the railway stations at Peri, Vicenza, Cittadella, Castelfranco, Treviso, Casarsa, and Cividale, and also on hostile seaplane stations.

GERMANY

May 17—Two Enemy Machines Brought Down—Lieut. Immelmann shot down his 15th aeroplane west of Douai. An English aeroplane was brought down in an air fight near Fournes. The occupants, two British officers, both wounded, were taken prisoners.

(See English Official)

May 17—Bombs on English Cruiser—Yesterday afternoon (May 16) some British naval forces appeared off the coast of Flanders. Some German warships, accompanied by patrol boats, left the harbour and went to meet them. A short fight at long range ensued, during which one of the German aeroplanes dropped bombs on an enemy cruiser, which was observed to be hit near the conning tower.

May 19—Enemy Machine Brought Down—There was great air activity on both sides. Lieutenant Boelke brought down his 16th enemy aeroplane south of Ripont (north-west of Tahure, in Champagne). The railway station, airship shed, and barracks near Epinal were pelted with bombs.

May 20—Five Enemy Machines Shot Down—Five enemy aeroplanes were shot down, one by infantry fire south-east of Vailly and four in air fights near Auberville, at the south border of the Hossen Wood, near Avocourt, and just east of Verdun. Our aviators successfully attacked enemy vessels off the coast of Flanders, military camps, aerodromes and the railway station near Dunkirk, Saint Pol, Dixmude, Poperinghe, Amiens, Chalons, and Suippes. In the district of Smorgon (in Russia) a German aviator brought down a Russian aviator.

May 20—Raid on Kentish Coast—On Friday night (May 19) one of our naval air squadrons starting from the coast of Flanders dropped a large number of bombs on the port and fortifications of Dover, and on Deal, Ramsgate, Broadstairs, and Margate. Extensive fires and explosions were observed at numerous points. Our aeroplanes were heavily fired upon by hostile coast batteries and patrol boats, but all returned undamaged.

(See English Official)

May 21—Bombardment of Dunkirk—Near Ostend an enemy aeroplane was shot down by our anti-aircraft guns, and fell into the sea. Four other machines were brought down in the course of aerial fighting, two of them within our lines near Lorgies, north of La Bassée and south of Château Salins, and the others behind the enemy's front at the Bourru Wood, west of the Meuse and east of Verdun. Our aeroplane squadrons again hotly bombarded Dunkirk from the east during the night (May 20).

(See French Official)

THE AIR SERVICES

PAY IN THE ROYAL FLYING CORPS—A Royal Warrant issued in Army Orders on May 18 states that from April 1 the daily rate of pay for an officer as Wing Adjutant in the Royal Flying Corps shall be £1 per day inclusive of flying pay and all additional pay.

The Secretary of the Admiralty announces that letters and postal parcels for the Royal Naval Air Service stationed abroad should be addressed as follows:—

(1) Official number (if known); (2) rank or rating; (3) name; (4) unit, e.g., "No. 2 Wing," "No. 3 Kite Balloon Section," "Airship Detachment, No. 2," or, if serving in one of H.M. ships, give the name of the ship; (5) care of G.P.O. The words "Mediterranean Expeditionary Force" should not be used in the address of letters to units on the Mediterranean station.

The rates of postage to R.N.A.S. abroad are: Letters, 1d. per oz.; postcards, 1d. each; newspapers, ½d. per 2 oz.; parcels not exceeding 3 lb., 1s.; over 3 lb. and not over 7 lb., 1s. 9d.; over 7 lb. and not over 11 lb., 2s. 6d.

The following R.N. Air Service squadrons have been given numbers, as shown: Wing Commander Gordon's Squadron, No. 6 Squadron; Squadron Commander Cull's Squadron, No. 7 Squadron; Squadron Commander Nanson's Squadron, No. 8 Squadron. Correspondence for officers and men serving with these squadrons should be addressed to the respective squadron numbers. Correspondence should not be sent to the Admiralty or Air Department to forward.

"WHITECRAFT" OUTING

The Whitehead Company entertained its employees with an excursion to Southend last Saturday to commemorate the first anniversary of the foundation of the Whitehead aeroplane business. The excursion proved an unqualified success from every point of view. During his speech, after luncheon at the Ship Hotel, Mr. J. A. Whitehead stated that he started business exactly 12 months ago (May 19th, 1915) on a borrowed capital of £200. They now had a capital of £100,000, and could obtain as much more as required. Their present capacity was about six machines a week. They had over 400 employees, and a pay-sheet of about £1,000 weekly.

Mr. Whitehead stated in his opinion the war would be finally settled by means of aircraft, and to enable the industry to do duty by the country it was absolutely essential for the Government not only to place substantial contracts, but also continuous contracts.

Mr. Whitehead pledged his word on behalf of the Whitehead Company, that if the Government would give their firm an unlimited order, at four months' notice they would deliver complete machines at the rate of 1,000 per month.

RUBBER HOSE FROM STOCK

The most important quality that any form of accessory can possess is that its manufacturer or seller should always have it in stock in sufficient quantity to supply any immediate lively requirements. Messrs. Harold, Harley and Co., recognising this fact, always keep an exceptionally large stock of petrol-proof rubber hose of $\frac{3}{8}$ in. and 1 in. internal diameter, while other sizes can be supplied to requirements. It may be of interest to constructors to note that this hose can, if desired, be passed at the Harley works by the A.I.D.

SOCIETY OF MOTOR MANUFACTURERS AND TRADERS

A meeting of the Aero Committee of the above Society was held on May 8, when there were present: Mr. H. White-Smith (in the chair), and Messrs. S. D. Begbie, R. O. Cary, L. Coatalen, F. May. In attendance, the Secretary.

Committee—Mr. T. C. Pullinger (Arrol-Johnston, Ltd.) and A. J. Crump (H. M. Hobson, Ltd.) were elected.

Chairman—Mr. H. White-Smith was unanimously re-elected. *Excess Profits*—Reply from the Chancellor of the Exchequer had been circulated. In the circumstances it was decided this Committee would take no further action in the matter, but would request the Special Committee to specifically exclude the aircraft industry, should they decide to apply for an increase of the statutory percentage. Report was presented on action taken by the Management Committee and Council in support of opposition to the dual taxation proposed under the Budget.

A meeting of the Aero Section was held at the Royal Automobile Club on May 11. In the absence of Mr. White-Smith, Mr. Begbie was requested to take the chair of this meeting, when it was reported that the Aero Committee had recently been strengthened by the co-option of two members. Communications were read from Thrupp and Maberly, Ltd., and Wolseley Motors, Ltd., nominating Mr. G. H. Thrupp and Mr. B. Caillard respectively, and it was resolved to recommend to the Council that the Committee be reappointed with the addition of those two gentlemen.

"SHELL" MOTOR SPIRIT

The following communication has been received from the Asiatic Petroleum Co., Ltd., the proprietors of "Shell" motor spirit:—

"We regret to have to inform you that, contrary to the hopes which we had entertained, we have been compelled to raise the price of our motor spirit to that of our competitors. If, in addition to supplying the British and Allied Forces all over the world with the quantities necessary to them, we had been able to supply motorists in this country with their requirements, we should have been pleased to adhere to the price at which we have been selling now for a very long time, but in view of our inability to supply the quantities required it was becoming clear to us that the policy which we had followed was not giving satisfaction to motorists in this country, and in fact was creating grave difficulties in many directions.

"As soon as it became apparent that the demand was exceeding the supplies at present available, we invited the co-operation of motorists in economising the use of motor spirit, but our efforts in this direction were to some extent thwarted by an announcement made by our competitors that ample quantities were available. The result has been that no sufficient economy in the use of motor spirit has taken place, and with the further rise in price last week it was obvious that at the increased margin the situation became altogether impossible. The new price will enable us to secure supplies from new sources, if it be found that these are still required by our clients, whom it will be our constant endeavour to serve, in so far as this can be done consistently with the national needs."

[It is understood that the new price of "Shell 1." will be 2s. 10d., as compared with the former price of 2s. 2d.—ED.]

BOOKS RECEIVED

- "AEROPLANE DESIGN" by F. S. Barnwell, and "A SIMPLE EXPLANATION OF INHERENT STABILITY," by W. H. Sayers. London: McBride, Nast and Co., 1916. 102 pp., figs.
- "THE PETROL ENGINE, THE MAGNETO AND THE CARBURETTER, THE AIR SERVICES, NOTES ON AIR RESISTANCE" (*Complimentary Edn. presented to the Royal Air Services by the Daimler Co., Ltd.*). A. E. Berriman. London: Methuen and Co., 1916. 289 pp., figs. and tabs.
- "THE AEROPLANE" A. Fage. London: Ch. Griffin and Co., 1916. Second edition. 160 pp., figs. Price 6s. net.
- "THE DESIGN OF AEROPLANES" Arthur W. Judge. London: Whittaker and Co., 1916. 205 pp., figs. and tabs. Price 9s. net.
- "THE SUNBEAM-COATALEN AIRCRAFT MOTORS." The Sunbeam Motor Car Co., Ltd., Wolverhampton. 47 pp., illus.
- "THE NAVAL ARCHITECT'S, SHIPBUILDER'S AND MARINE ENGINEER'S POCKET-BOOK" By Clement Mackrow, M.I.N.A., and Lloyd Woollard, M.I.N.A. Eleventh edition. London: Crosby, Lockwood and Son, 1916. 742 pp., figs. and tabs. Price 12s. 6d. net.
- "STERING BY THE STARS FOR NIGHT FLYING, NIGHT MARCHING, AND NIGHT BOAT WORK BETWEEN LATITUDES 40° N. AND 60° N." J. Dundas White, LL.D., M.P. London: J. D. Potter, 1916. 32 pp., maps. Price 1s.
- "THE NAVY LEAGUE ANNUAL, 1915-16." Edited by Robert Verburgh. London: John Murray, 1916. 388 pp.

PATENT INFORMATION

This list is specially compiled for AERONAUTICS by Messrs. Rayner and Co., Registered Patent Agents, of 5, Chancery Lane, London, from whom all information relating to Patents, Designs, Trade Marks, etc., can be obtained gratuitously.

LATEST PATENT APPLICATIONS

- 6,278, 6,279, 6,280, 6,281 G. H. Challenger. Aircraft. 2/5/16.
6,235 T. A. Craven. Aerial automatic apparatus for discharging bombs, bullets, and arrows. 2/5/16.
7,473 E. K. Davies. Aerial machines without aerostats. 5/5/16.
6,384 J. R. Huck. Airships. 4/5/16.
6,341 G. S. McGregor. Aeroplanes. 3/5/16.
6,278, 6,279, 6,280, 6,281 H. A. Savage. Aircraft. 2/5/16.
6,461 E. J. Verstraette. Flying machine. 5/5/16.

SPECIFICATIONS ACCEPTED THIS WEEK

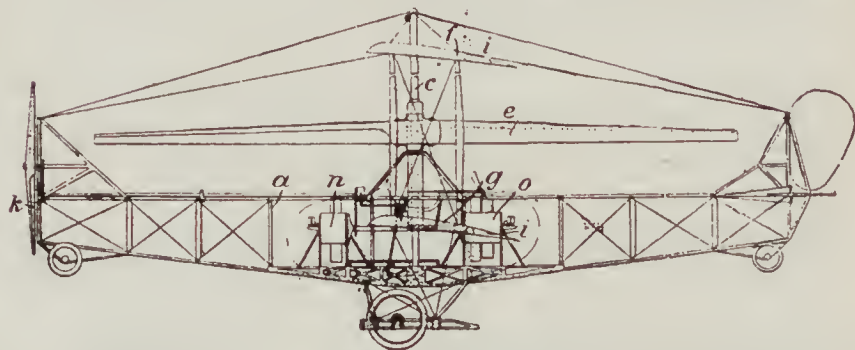
- 12,706 Keith. Aeroplanes, hydro-aeroplanes, airships, and the like.

SPECIFICATIONS PUBLISHED THIS WEEK

- 8,823 Harris. Aeroplanes.

LATEST PUBLISHED ABSTRACT

- 445 "Aeronautics." F. V. Lister, 41, Eastcheap, London. The lifting-propeller *e* of a helicopter is mounted at or about the centres of resistance in both horizontal and vertical directions on a standard *c* arranged centrally of the machine, so that the axis of the propeller shaft passes through the centre of gravity of the machine. The propeller is driven through clutches and bevel-gear from



motors *n, o*. A tractor propeller *k* is driven from the shaft of the motor *n*. The machine is fitted with superposed planes *f, g*, extending laterally of the fuselage *a*. The rear parts *i* of the planes may be turned into a vertical position to decrease the resistance of the wings to vertical movement. Steering—The parts *i* of the wings at the two sides of the machine may be moved in opposite directions for balancing.

Printed copies of the specifications and abstract can be obtained from Messrs. Rayner and Co., at the price of 1s. each.

COMPANY NEWS

MAYRO-WING AVIATION CO., 82a, Lillie Road, Fulham S.W.—Application for debtor's discharge to be heard June 1.

	IMPORTS		EXPORTS		RE-EXPORTS	
	1915.	1916.	1915.	1916.	1915.	1916.
January	... 20,382	1,509	435	6,399	13,706	—
February	... 380	6,444	138	30,693	18,823	—
March	... 280	3,388	7,218	17,872	5,090	7
April	... 2,189	3,383	23,986	22,608	275	3,783
	23,231	14,724	31,777	77,572	37,894	3,790

AERONAUTICS

A WEEKLY JOURNAL DEVOTED TO THE TECHNIQUE OF AERONAUTICS

(FOUNDED 1907)

Edited by JOHN H. LEDEBOER, B.A., A.F.Ae.S.

VOL. X. No. 137 (NEW SERIES)

MAY 31, 1916

[Registered at the G.P.O.
as a Newspaper]

ONE PENNY

THE NEW PROGRAMME

"An Air Ministry will surely come, though the machinery of Government moves slowly."—"Daily Telegraph," March, 1913.

"Having said so much, I should like to add that I think such an Air Ministry or Air Department is destined to come. I see before myself before many years have passed . . . a dream of a single Service under a single head, under a single roof, with a single organisation."—Earl Curzon, May, 1916.

* * *

TRULY, we have moved far since those early barren days of three years ago, when the outlook seemed hopeless and any voice uplifted in warning of impending dangers died away and found no echo. The industry was then in a parlous condition, ground down under the iron heel of South Farnborough despotism; had it not been for the far-seeing and courageous action of one statesman, acting not only on his own initiative, but compelled by his colleagues' apathy to adopt surreptitious methods, the industry could not have survived another year, and the outbreak of war would not only have found us even less prepared than we actually were, but in no position to expand in the marvellous fashion that we know. The country and the industry owe Mr. Winston Churchill a deep debt of gratitude. The pity of it is that the events and developments that have come to pass were accurately foretold as the quotation at the head of this page shows, and that it is not until the war is about to enter upon its third year that the necessity for urgent reforms is officially realised at last, or, rather, that those who are responsible for the conduct of the war have been compelled to acknowledge the failure of the old system.

* * *

There is hope for the future. After years of effort, after endless criticism repeated to the stage of boredom, we can at last see a glimmer of light. When the scheme of the Curzon Committee was first announced we entertained grave fears that this was but another patch in the crazy-quilt of present-day governance, and so it might have been but for the strong personality of Earl Curzon, who, in his single-minded desire to achieve real reform, will, in his thankless task, receive that universal sympathy and support for which he has asked. The constitution of the Air Board was commented upon last week, but its functions and the tentative programme which had been mapped out for it were as yet unknown, and it has remained for Lord Curzon himself to announce them, which he did last week in a wholly admirable speech. The programme is excellent and fairly comprehensive, though its initiator wisely confined himself to generalities, having no first-hand knowledge of the extraordinarily complex problems wherewith he will be called upon to deal. Remains now to be seen how it will be carried out in practice.

* * *

The primary function of the Board, easy and obvious though it may appear to the uninitiated, is by far its most difficult one. It is to prevent "rivalry and overlapping" between the two services and their departments. By its success or failure in this respect the Board will eventually be judged. How this essential portion of the programme is to be carried into effect is not stated, wisely perhaps, for

Lord Derby, when he attempted to tackle the problem, found himself faced by an unscaleable wall of prejudice and what may be described as vested interests. Fortunately, Lord Curzon proceeded to outline briefly some of the chief subsidiary problems which the Board is to set itself to tackle. It is to enquire into (1) the position in respect of machines and men at the various fronts; (2) the organisation of long-range offensive operations; (3) the defence of this country by aircraft and guns against hostile aerial attack; (4) the use and development of lighter-than-air machines and the supply of the best types of aeroplanes and engines; (5) the armament of aircraft; (6) national air factories; (7) new inventions; (8) provision for flying grounds and centres.

* * *

But this is not all. For in the background of their intelligence the members of the Air Board are prepared to keep in mind the larger issues, and more important. They will remember, so it is said, the possibility of the amalgamation of the designing and contract branches of the two Air Services. They will devote attention to the amalgamation of the two respective staffs of the two departments; to the formation of a national air service, and to the institution of national factories.

* * *

Here are the objects in view. The grounds are known to our readers. On the whole, and in its stark wording, we agree with this portion of the programme, and this mainly because it will lead to larger things and to a more general reorganisation—it is bound to open the minds of those who participate in the meetings of this conglomerate body to the greater issues, and to their solution in particular.

* * *

One thing I may be allowed to draw attention to, and that is the programme of urgently-needed reforms, reforms which, be it added, are capable of being put into immediate execution, which was outlined in our last issue. Therein we enunciated our own programme of reform—the rest will follow: (1) the unification of the two existing inspection departments; (2) the standardisation of parts; (3) the unification of methods of training pilots and mechanics; and (4) the co-ordination of the system of training at the Service and private schools. We adhere to that programme in all its essentials, and would commend it to the consideration of the new Board as the subject for immediate and possible reform, and this without disorganising any institutions extant.

* * *

If we severally and collectively had, every one of us, done our duty the war would have been won ere now. It is not, and therein lies the gravest possible indictment of our pre-war system of *laissez-faire*. The Curzon Committee has its chance; it has the support of all parties. It may, in devious ways, bring about the aerial salvation of England, provided it acts up to its lights and that without fear of consequences. But there must be no mistakes; no prejudice; above all, no trimming. Remember the past long, lean years. Conscience may make cowards of us all; but cowardice may make some of us conscientious.

J. H. L.

CORRESPONDENCE

ENGINEERING AND THE WAR

THERE has been a considerable amount of destructive criticism of our various administrations; may I venture to put forward a little constructive suggestion on one or two matters connected with engineering and the war.

The Formation of a Corps of Mechanical Engineers

Now that we have conscription, and all manner of men will be swept into the Army, it is imperative that the potential utility of engineers, draughtsmen, and technical workers generally should not be lost. There is a great demand for all such men in connection with the design, manufacture, inspection, and maintenance of munitions and aircraft.

The Use of Engineer Inspectors of Performance in the Field

There is insufficient direct touch between the users of engineering material in the field and the inspectors of workmanship in the factory at home. The latter should be supplemented by Engineer Inspectors of Performance in the Field, and the detail inspection should be carried out in the light of their experience. A modification of existing inspection procedure on these lines might do much to accelerate the construction of aircraft, but in order to carry it out it would be necessary to obtain suitable men from the Corps of Mechanical Engineers.

The Formation of an Advisory Board of Contractors

Much delay in the manufacture of engineering material has been caused by the unnecessary splitting up of contracts. The importance attaching to fundamental engineering difficulties carries too little weight in the minds of military administrators, and it would be the object of the Board of Contractors to emphasise the proper line of least resistance to the rapid output of engineering material.

In time of war, Government Departments should be empowered to take manufacturers into their confidence, and arrange with them the most effective distribution of work. This is rendered all the more reasonable a procedure by the regulations regarding excess profits.

Lack of sufficiently close co-operation between official departments and the engineering contractors is one of the most serious adverse criticisms that can justly be made against the present administrations. I suggest that each department should establish an advisory board of its own principal contractors, with whom the allocation of work should be discussed.

This would surely have avoided such an anomaly as telling an aircraft factory to put down a plant for machining large shells, while a maker of large shells is asked to put down a new machine shop especially for aircraft work.

Before an engine or other similar unit can be produced in quantities, a most elaborate and costly collection of jigs and tools has to be prepared. If a contract is split up among several different makers, all this work has to be duplicated, and the difficulty of ensuring interchangeability is increased.

Under existing circumstances, a contractor has to tender for what he happens to be asked to make.

Sometimes he is told that he is not required to do any more of the work for which he is equipped, when he is well aware that other firms have but recently been given contracts that will involve making a replica of his special plant.

Such policy may serve very well under the competitive conditions of peace, but it is wasteful in the extreme under the co-operative conditions of war.

The proportion of skilled labour available to skilled work to be done is steadily decreasing, and it behoves us to economise the engineering capacity of the country to the utmost. This can only be done by working under the conditions of maximum efficiency.

The suggestions that I have made above would, I believe, conduce to this end, if carried into effect.

A. E. BERRIMAN,

Chief Engineer of the Daimler Co.

METEOROLOGY AT THE FRONT

To the Editor of AERONAUTICS

SIR,—The remarks in May 10 issue of AERONAUTICS concerning the breaking away and loss of twenty observation balloons, and the capture of fifteen of them by the Germans, must give rise to many misgivings as to the quality of the expert meteorology which is available to the Allies. No other deduction could be arrived at than that suggested by the writer of the note, "Meteorology at the Front" (p. 300), viz., that such an "accident"—save the mark!—was merely the outcome of ineptitude or gross carelessness, or a mixture of the two. Meteorology is still sneered at by the ignorant, and I suppose this will continue until there is some colossal disaster due to the want of the adaptation of this particular branch of science to the needs of war. It may be recalled that in 1896 motor transit was ridiculed, that in 1906 long flights in the air were only imagination run riot, and now in 1916 meteorology is merely, in the stucco opinion of our military advisers, "guessing at the weather." I may state that, if there had been a single qualified and tried meteorologist within hail on the occasion of the loss of the twenty French balloons, not a single one would have been damaged. I add, most emphatically—for I know—that the want of a meteorological service, or, in any event, the absence of any symptom of an intelligent service, have resulted in the waste of thousands of the lives of our soldiers at the Front. There were statements in General Hamilton's Gallipoli report which conclusively showed that he had no meteorological advice worth having, and he admitted that this resulted in at least one of the series of lost battles. The way our gas was used in France will doubtless be the subject of enquiry after the war, and I am not going to deal with it here. Our generals are perpetually complaining that the weather is against them, and this is very irritating to those who know that they could have it all on their side. Prior to the war our Meteorological Office was discarded by those who required safe weather advice; but, with the Empire at stake, things are permitted to slide. "No science as usual" remains the motto of our War Council.

C. V. DIEHL

NOSTRA CULPA

To the Editor of AERONAUTICS

SIR,—AERONAUTICS, May 24, page 339, column 2, line 8. "Lathe," instead of "lath," suggests that Lord Salisbury "turned" Heligoland over to Germany.

THE DUDBRIDGE IRON WORKS, LTD.

Stroud, Glos., May 26, 1916.

To the Editor of AERONAUTICS

SIR,—Extract from Mr. John Wallace's article on "The Design of Aero Engines" in your issue of May 17, 1916: "Suppose that the air traffic at this point (Weybridge) had reached—say, fifty unsilenced machines landing, and an equal number of unsilenced machines were starting every hour."

Yes; just suppose one machine landing or ascending every 24 seconds! To say the *least* about it (the author's phrase), the resulting noise *would* cause considerable annoyance to residents in the vicinity.

F. T. MAHGNI-ELTTEN

R.F.C., B.E.F., May 22, 1916.

To the Editor of AERONAUTICS

SIR,—May I point out to you that the R.A.F. engine is *not* fitted with auxiliary connecting rods, as stated in an article written by Mr. J. Wallace in AERONAUTICS of May 24, 1916.

H. WALKER

Birmingham, May 25, 1916.

THE SHOCK-ABSORBER



MR. TENNANT said that in his capacity of shock-absorber he had received so many shocks that he had become inured to them. MR. ASQUITH, asked by Commander Bellairs whether he was aware that a considerable strain was placed on the Under-Secretary for War, replied: "I am well aware of the great pressure under which my right hon. friend has laboured . . . but I am glad to say that he shows no sign of being unable to bear the strain."

REPORT No. 3*

REPORT COVERING INVESTIGATIONS OF AVIATION WIRES AND CABLES, THEIR FASTENINGS AND TERMINAL CONNECTIONS

By JOHN A. ROEBLING'S SONS CO.

(Continued from page 322)

Figures 14 and 15 show modifications of this type to overcome any objections which might be raised to the double eye. The wedge and a substantial thimble are combined in one piece. To secure more points of contact, and consequently greater friction, and also for greater flexibility, the taper ferrule is made of finer wires and with more convolutions. The wedge thimble may be open or closed, as desired. Fracture took place at "E." Average efficiency, 94 per cent.; range, 92 to 96 per cent.

STANDARD WIRE FOR STAYS FOR AEROPLANES

The original object in the manufacture of this material was the securing of the wire as strong as possible in order to reduce the weight as much as possible. This resulted eventually in the manufacture of a wire so hard and strong that difficulty was experienced in forming the eye and bend over the ferrule without breaking the wire. The result of this was a lack of confidence in high-strength wire, and in some cases the reaction extended to the use of a wire which could properly be classed as a soft wire. The process of soldering terminals on wire stays

therefore recommended as representing suitable high-grade material for the purpose :—

Standard Aviator Wire (Tinned)						
Diameter (inches)	American Gauge (Brown & Harpe)	Nearest Fraction of inch	Minimum Breaking Strain	Minimum Torsion in 6 inches	Minimum Number of Bends through 90° over ³ / ₁₆ inch Radius of Jaws	Weight in pounds per 100 feet
0.204	4	¹³ / ₆₄	6,700	9	4	11.15
0.182	5	¹¹ / ₆₄	5,500	10	4	8.84
0.162	6	⁹ / ₆₄	4,500	11	5	7.01
0.144	7	⁷ / ₆₄	3,700	12	6	5.56
0.128	8	¹ / ₈	3,000	14	8	4.40
0.114	9	⁷ / ₆₄	2,500	16	9	3.50
0.102	10	—	2,000	18	11	2.77
0.092	11	³ / ₃₂	1,620	21	14	2.20
0.081	12	⁵ / ₆₄	1,300	24	17	1.744
0.072	13	—	1,040	27	21	1.383
0.064	14	¹ / ₁₆	830	31	25	1.097
0.057	15	—	660	34	29	0.870
0.051	16	—	540	39	34	0.690
0.045	17	³ / ₆₄	425	44	42	0.547
0.040	18	—	340	49	52	0.434
0.036	19	—	280	55	70	0.344
0.032	20	¹ / ₃₂	225	61	85	0.273
0.028	21	—	175	70	105	0.216

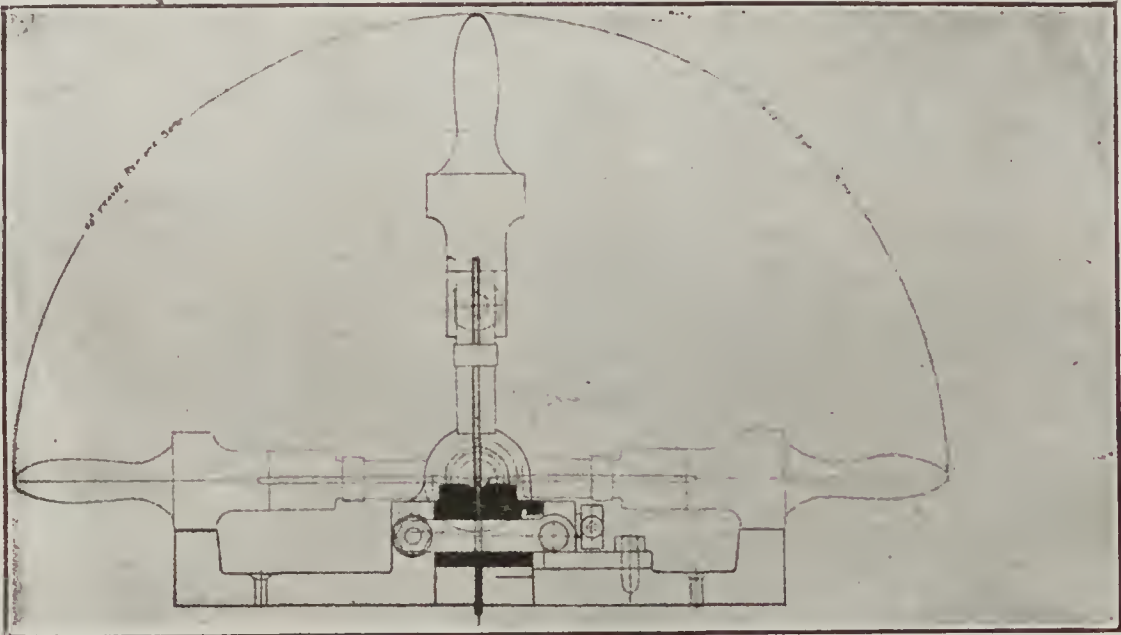


PLATE No. 2

undoubtedly helped to a great extent in building up this prejudice. Nevertheless it is still true, as at first, that a strong wire which is serviceable permits the possibility of reducing weight and is therefore desirable. The great number of tests on wire and stays, which were necessary to determine the properties of different types of terminals as described above, afforded a very excellent opportunity to note conclusively the effect of using various grades and strengths of wire. We determined that it was all important that the wire should be tough and ductile, as well as strong. All bends should be made without danger of fracture. In addition to requirement for tensile strength, we found it necessary to recommend requirements for torsion and bend. As the per cent. efficiency of the stay due to loss of strength at terminal is as great with a strong wire as with a weaker wire, as was clearly demonstrated in our tests, it followed conclusively that as high a strength as can be secured commercially under the conditions of torsion and bend test required was desirable. The following specification is

* First Annual Report of the National Advisory Committee for Aeronautics, 1915, Washington.

PLATE No. 2

Breaking strain—Test sample should be at least 15 inches long, free from nicks or bends. It should measure 10 inches in the clear between the jaws of a standard testing machine. Load should be applied uniformly at a speed not exceeding 1 inch per minute.

Torsion—Test sample should be gripped by two vices 6 inches apart. One vice is turned uniformly at a speed not exceeding 60 revolutions per minute. On the large size of wire this speed should be reduced sufficiently to avoid undue heating of the wire. The vice which is not turned should have free lateral movement in either direction.

Bend test—Wire for bending test should be a straight piece. One end is clamped between jaws having their upper edges rounded to ³/₁₆-inch radius. The free end of the wire is held loosely between two guides and bent 90 deg. over one jaw. This is counted one bend. On raising to vertical position the count is two bends. Wire is bent to the other side and so forth, alternating to fracture, each 90 deg. bend counting one.

Diameter of Strand	Breaking Strength of Strand	Approximate Weight per 100 feet
$\frac{1}{8}$	12,500	20.65
$\frac{3}{32}$	8,000	13.50
$\frac{7}{32}$	6,100	10.00
$\frac{1}{4}$	4,600	7.70
$\frac{5}{16}$	3,200	5.50
$\frac{3}{8}$	2,100	3.50
$\frac{7}{16}$	1,600	2.60
$\frac{1}{2}$	1,100	1.75
$\frac{5}{8}$	780	1.21
$\frac{3}{4}$	500	0.78
7 wire }	185	0.30

PLATE NO. 3

ROEBLING 19-WIRE GALVANIZED AVIATOR STRAND
 Roebbling galvanized aviator strand consists of 19 fine wires

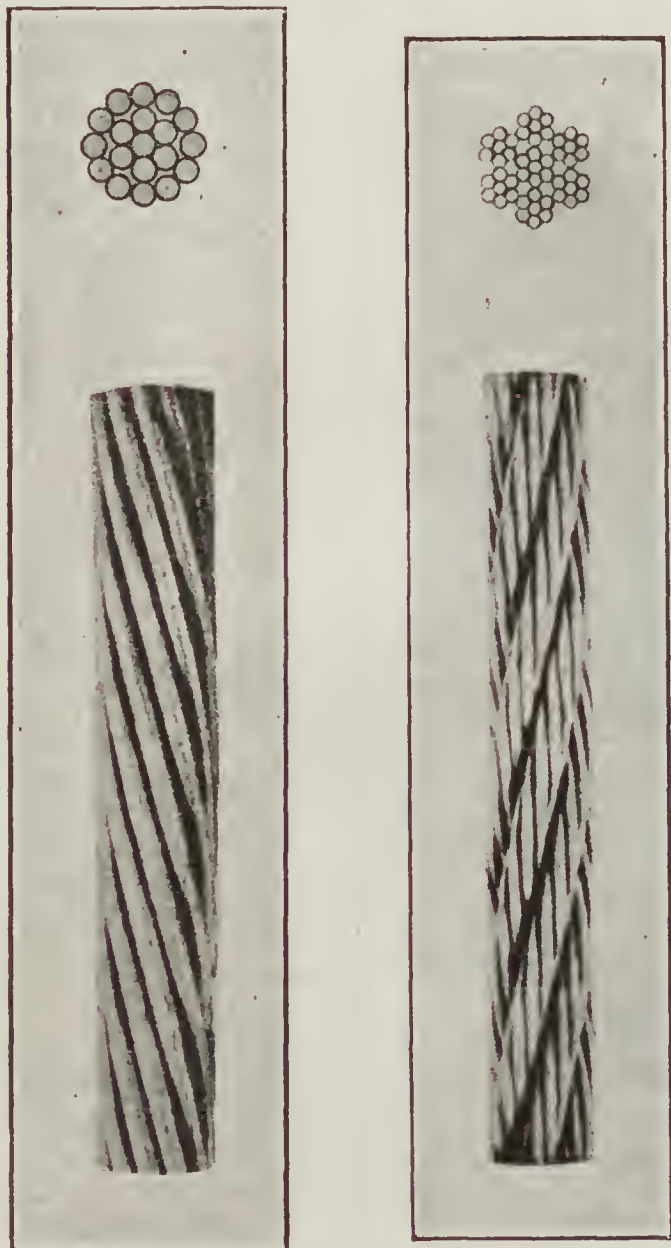


PLATE No. 3

PLATE No. 5

of great strength stranded together. On account of its small size the $\frac{1}{32}$ inch diameter strand is made of seven wire. This strand is not very flexible, and is used for stays. This strand is approximately one and one-third times as elastic as a solid wire of the same material.

Thimble Spliced in Each End

Diameter of Strand	Breaking Strength of Strand	Breaking Strength of Stay	Efficiency (per cent.)	Approximate Weight per 100 feet
$\frac{1}{8}$	8,000	7,200	90.0	13.50
$\frac{3}{32}$	6,100	5,500	90.0	10.00
$\frac{7}{32}$	4,600	4,180	91.0	7.70
$\frac{1}{4}$	3,200	3,000	93.7	5.50
$\frac{5}{16}$	2,100	2,060	98.2	3.50
$\frac{3}{8}$	1,600	1,570	98.1	2.60
$\frac{7}{16}$	1,100	1,100	100.0	1.75
$\frac{1}{2}$	780	780	100.0	1.21
$\frac{5}{8}$	500	500	100.0	0.78

PLATE NO. 4

ROEBLING 19-WIRE GALVANIZED AVIATOR STRAND

Figure No. 1 shows thimble spliced in 19-wire galvanized aviator strand.

Figure No. 2 shows the splice after the serving is applied.

Figure No. 3 shows the broken wires after the stay had been tested to destruction in the testing machine. It will be noted there are four broken wires. This break always occurs at the last tuck in the splice and never around the thimble.

Diameter of Cord	Breaking Strength Cord (pounds)	Approximate Weight per 100 feet
$\frac{1}{8}$	2,000	2.88
$\frac{3}{32}$	2,800	4.44
$\frac{7}{32}$	4,200	6.47
$\frac{1}{4}$	5,600	9.50
$\frac{5}{16}$	7,000	12.00
$\frac{3}{8}$	8,000	14.56
$\frac{7}{16}$	9,800	17.71
$\frac{1}{2}$	12,500	22.53
$\frac{5}{8}$	14,400	26.45



PLATE No. 4

PLATE No. 5

ROEBLING 7 BY 19, TINNED AVIATOR CORD

Roebbling tinned aviator cord is composed of 7 strands of 19 wires each. This wire is made from the highest grade of steel and given a heavy plating of tin. It is used principally for stays on foreign machines. This cord is approximately one and three-quarter times as elastic as a solid wire of the same material.

Thimble Spliced in Each End

Diameter of Cord	Breaking Strength of Cord	Breaking Strength of Stay	Efficiency	Approximate Weight per 100 ft
$\frac{1}{8}$	2,000	1,600	Average of 54 tests 83.6 per cent.	2.88
$\frac{3}{32}$	2,800	2,300		4.44
$\frac{7}{32}$	4,200	3,500		6.47
$\frac{1}{4}$	5,600	4,700		9.50
$\frac{5}{16}$	7,000	6,000		12.00
$\frac{3}{8}$	8,000	6,800		14.56
$\frac{7}{16}$	9,800	8,200		17.71
$\frac{1}{2}$	12,500	10,400		22.53
$\frac{5}{8}$	14,400	12,000		26.45

(To be continued)

PROGRESS OF AMERICAN AVIATION

By ERNEST L. JONES, American Editor

WRIGHT COMPANY TO CONTROL HEMPSTEAD

THE Hempstead Plains aviation field has been leased by the Wright Co. for a term of one year from the Garden City Co., with option of three years. Present occupants of the sheds have been notified by the latter concern that their leases expire May 21.

Howard M. Rinehart and W. B. Atwater, instructors now at the Augusta, Ga., school of the Wright Co., will conduct the school at Hempstead.

The new Wright Co., now at 60, Broadway, New York, was organized last fall by a Wall Street syndicate, composed of Albert H. Wiggin, Wm. B. Thompson, and F. F. Manville. They bought the old Wright Co., and increased its capital stock from \$1,000,000 to \$5,000,000 (£200,000 to £1,000,000).

Henry Lockhart, president of the Simplex Motor Car Co., was first made president. He has since resigned, and his

The Wright school will consist of three model B machines, one model C, and an H.S., a photograph of which accompanies.

THREE NEW CURTISS RECORDS

WORLD'S records for altitude, speed and duration were broken on April 30 at the Atlantic Coast Aeronautical Station, Newport News.

Victor Carlstrom, flying the new twin-motored tractor aeroplane, of the model J-N Curtiss type, climbed 16,500 ft. in 1 hr. 30 min., carrying a passenger. The machine used is a new type of military aeroplane, equipped with two model OX-2 Curtiss motors of 90 h.p. each. The pilot and observer are in a nacelle-type fuselage, giving a wide and unobstructed range of vision. The flight established a new record for altitude and rate of climb with passenger. The machine showed a speed of 100 miles per hour and climbed well on one motor.



THE WRIGHT H.S. IN FLIGHT

office is now held by Edward M. Hager, president of the Universal Portland Cement Co., of Chicago.

The tenants now occupying sheds at Hempstead Plains are the following:—1st Battalion of the New York National Guard; this department has been busy training soldier aviators since November 1, 1915; General Aeronautic Co., the New Jersey Aeroplane Co., the Empire State Aircraft Co., Sidney F. Beckwith and Edward Crabtree, the Sloane Manufacturing Co., the Interstate Aviation Co., the M.F.P. Aeroplane Corporation, and Lewis G. Young, of 19, East Fifty-fourth Street.

The policy of the Wright Co. with respect to the present tenants at the field will be liberal. Any firm or individual with machines in condition to fly regularly may continue to rent sheds—at least for the present. One idea is to have as large a volume of flying as possible at the field. No manufacturing or school work will be permitted, however, save by the Wright Co. itself or the National Guard.

The second and third records were made by T. C. Macauley with the model H-10 Curtiss flying-boat, equipped with two model VX 160 h.p. Curtiss motors. Macauley carried six passengers in addition to himself, and remained in the air 1 hr. 10 min., climbing 1,000 ft., and making a speed of 88 miles per hour. The previous world's records for duration and speed with pilot and six passengers were held by M. Garaix, of France, with a speed of 67.2 miles per hour and duration in the air 1 hr. 2 min.

NEW COMPANIES

LANZIUS AIRCRAFT COMPANY, 1600, Broadway, New York, has been incorporated for \$2,000,000 for the purpose of exploiting the aeroplane invented by George Lanzius, a Hollandish mining engineer. The machine, the first sample of which is now being built by C. and A. Wittemann, Stapleton, S. I., combines a cantilever frame with the planes pivoted in the frame and capable of movement to varying angles of incidence at the will of the pilot during flight.

STATEMENTS IN PARLIAMENT

HOUSE OF LORDS

May 23—*Reorganisation of Air Services*—Lord Montagu of Beaulieu moved:—"That this House considers that the development of aviation for purposes of war can no longer be efficiently carried on under the present system of the divided control and responsibility of two separate departments; and that the time has now arrived when the supply of men and materials should be concentrated under single control, at the same time leaving the executive power over naval and military aircraft with the Army and Navy as at present."

He said: I rise with a sense of unusual responsibility. When I spoke a little more than two months ago I made certain statements which are to be the subject of inquiry by a judicial committee. I am going to that committee most willingly and as a matter of courtesy. I hold very strongly, however, that any criticisms which we in the House make on the Government on this or any other matter should be answered across the floor. This judicial committee consists mainly of gentlemen who do not pretend to be experts. I have every confidence in their impartiality, and I am prepared to submit everything I have said to their examination. There is very little in my past utterances on this question which has not come true.

I rejoice to know that in future we shall have Lord Curzon, who has taken immense interest in this question, and will shortly become an expert on it, to reply to criticisms. Other conceivable ways of getting over the difficulty of replying on technical points would be to make the Director of the Naval Air Service a peer. Sir David Henderson might contest a seat for the East of Kent, or at Lowestoft or Newcastle. I shall be surprised if the verdict of the committee is not favourable as far as my share in this matter is concerned.

Now I come to the Air Board that has been just appointed. Already I think this step has justified the part which I and others took in urging this matter upon your lordships' House and the country. I am delighted that Lord Curzon and Lord Sydenham are going to be members of this Board. I know it has been said that Lord Curzon is autocratic in nature, and I am delighted that he is, for his tendency to exercise autocracy may be of great benefit in the work which he has to do.

As far as I can make out the Air Board is the Montagu Committee, if I may use the term, with some added advantages. It has a Cabinet Minister in the chair, which is a great advantage, and, secondly, it could lay down an air policy, and it seems to me a melancholy thing that only now in the twenty-second month of the war we should be beginning to lay down an air policy. But supposing Lord Curzon disagrees with the Air Board on a question of policy. He would make representations to the Admiralty or the War Office and these two Departments would be advised by the very people who had disagreed with him. He would then appeal to the War Committee, on which he would meet Mr. Balfour and Lord Kitchener, who were naturally also advised by the same technical experts with whom he had already disagreed; and they would sit upon him also. As the next step he would take his case to the Cabinet and then, perhaps, he would meet still greater difficulties and have to face the criticism of the heads of the great departments who had blocked his way upwards. That is not a workable system. I want to see the noble earl master in his own house. If this Air Board is to do any good at all, it seems to me that he should be not only the head of a great supplying department, but that he should have power to order supplies and base them on the needs of his policy. I want to judge these matters by one test—how far do they help us to win the war?

In regard to what has to be done in the future I am aware that we shall have to justify fully our demand for a unified system of administration and for an Imperial Air Service. There may be difficulties in carrying out changes in time of war, but in this matter I think the Government may take their courage in both hands. Even if a mistake were made in giving the Air Board more power than it possesses to-day, I do not believe that that would be running half as great a risk as we should be running by going with timid and faltering steps along the path which eventually you will be bound to follow.

Already a step has been taken which has my approval and which Lord Derby also strongly advocated. The Royal Flying Corps has taken over De Keyser's Hotel, and I hope that that shows that Sir D. Henderson and his colleagues have in view getting the Air Service more and more free from the trammels of the past. I should like to see a Fifth Lord of the Admiralty—an Air Lord, to represent the views of those interested in naval aviation. Eventually a fully-fledged Air Ministry must come out of this; sooner or later the Imperial aspect of the Air Service will arise. I know that already Australia has taken the matter up, and that a great many of the leading men of Canada are seriously considering the idea. Thus the Air Service cannot be for this country alone. It must be an Imperial Air Service. I say deliberately that the first nation which achieves anything like supremacy in the air will have an immense advantage in war over any other. I will not reveal what we have done at the front; but I say without fear of contradiction that we have not got supremacy at the front. I do not agree with the declaration made by Mr. Bonar Law in the House of Commons the other day that we had supremacy at the front and maintained it ever since. I prefer the fairer declaration

of Mr. Tennant, who said on March 28 that at the moment the majority of the German aeroplanes were probably faster than ours, but that this state of affairs was being gradually altered. I think Mr. Bonar Law went far beyond what he was justified in saying.

I look forward to the day when the frontiers of India will be patrolled by aeroplanes, when aeroplanes will go up to discover where the peril exists, and whether the enemy is advancing from beyond the hills; when they will be used all over Australia for police purposes; when they will guard the gateways of our Empire at Singapore, Malta, and Gibraltar, and when they will fly over the prairies of Canada as frontier police. I think we shall also come to the time when aeroplanes will be used for commercial purposes, and especially when the carriage of mails and passengers by aeroplanes will become one of the common things of the day.

I know it is difficult to get a Government Department to look far ahead. For a Government Department "now" is never the appointed day. If you look back upon any of the great movements of the past you will find that the official world is always the last to accept the facts of the day. The same kind of official complacency exists to-day. In a time of war this state of mind is more serious than it would be in time of peace. There is a great risk in delay. We are only on the threshold of great developments in aerial warfare. No one can tell how far it is going, or what influence it may have on the course of the war. You cannot afford to wait much longer. The war is fast becoming one of exhaustion and stagnation. Each side is losing vast numbers of men. Aerial warfare can be waged with a less expenditure of men and better results. For 5,000 aeroplanes, with two men in each, you would want only 10,000 men. With aeroplanes you could do more damage to the enemy with a smaller number of men than you could do in any way on land.

I must confess that at times I feel like one standing at the curtained window of a room in which a sleeper lies in bed. I try to draw the curtain back, and the sleeper turns lazily over and says, "Don't draw the curtains yet; it will keep me from sleeping." That is the attitude of people in official circles.

The Empire is practically defenceless from above. We must at once face this peril in the air, or we shall be left behind to our utter ruin. The longer the war goes on the clearer it becomes that we must pay more attention to aerial warfare. Whether we look to the daily increasing accounts of combats in the air or to the enormous strides that are being made in the development of the aeroplane, we must see that this tendency is inevitable. We cannot successfully cope with that state of things so long as we have disorganisation and want of concentration and jealousy and friction between the two great arms of the Service. I tell you once more that you cannot win in the air with divided forces. I believe that every nation will before long be forced to create an Air Ministry by that sheer necessity which knows no law, which regards no precedent, and which fears no Government. The immense development of aircraft in all directions alone will compel the creation of an Air Department. You need at home just as much as at the front more concentration, more courage, more force. If you do not organise properly before the end of the war, you will live in constant dread of air raids taking place, which mean death and destruction. Is that a prospect you can face with equanimity? I am confident that, if we realise this peril now, the Air Minister of the future will have an easier task than the noble lord has now. He will be able, I hope, to echo that phrase of the psalm, "Thou shalt not be afraid for the terror by night, nor for the arrow that flieth by day." He will be able to assure his country that they need not be afraid of dirigible or aeroplane, and I hope he will be able to show you that your guardian angels, your own aircraft, will be ready to defend your homes and keep your country inviolate.

Viscount Milner seconded the motion.

Lord Derby's Speech—The Earl of Derby: There might be one or two points on which they slightly differed, but the general principle of the resolution seemed to him one which the Government had already accepted, and accepted, as he believed, for the benefit of the country.

When he had the honour of being the Financial Secretary at the War Office under Lord Middleton there was at the time at the War Office a general officer whom personally he had always looked upon as one of the most brilliant officers that had ever been in His Majesty's Army—Sir Henry Brackenbury. There was a discussion one day on the provision of sheds at Aldershot for dirigible balloons. He (Lord Derby) had taken the line that this was an unnecessary expense, and Sir Henry Brackenbury came to his room, and he would never forget the words he used: "I wish you would help me to get this through. I shall not live to see it. You may; but I believe that England is more in danger from the air than she has ever been since the Spanish Armada." That seemed to him to show the most extraordinary foresight. He was sorry to say that, although he thought he did support Sir Henry Brackenbury, after that he was rather in the position of the sleeper to whom Lord Montagu had alluded. He turned over and went to sleep again, and did not take the active interest in the Air Service which the noble lord himself had done.

Although there had been spasmodic interest nobody looking back could say that there was anybody in the War Office or the Admiralty who really took a big view of what was necessary for the aircraft or put it forward as essential for our welfare, and really it was left actually to a particular portion of the public Press to bring the whole question of aeronautics most prominently before the public. In his opinion, if it had not been for that spirit of emulation which was secured by large prizes and which gave the opportunity to firms not to cater for Army or Navy, but to cater for what he would call commercial and sporting purposes, he was perfectly certain we should not have been in the same position—even though it might not be as good as we wished at the present moment—for securing the aircraft we had as a matter of fact got.

As to the future, he, in the main, entirely agreed with Lord Montagu, speaking as to the general principle on which the organising of the Air Service should be run. He was not so certain as Lord Montagu was that the change could be made at the present moment. He saw the goal they ought to aim at, but had a little doubt whether they could arrive at it without disorganising the two Services to such an extent as, perhaps, to nullify the advantage that might be gained. He was certain that eventually the Air Service was going to play perhaps the most prominent part—he would not say in this war, but in the future advance of our Empire—and he was certain that any help that could be given to those Services ought to be given. There was no magic in having one organisation or in having a Minister at the head of it as long as they got a body that gave them what was wanted and a head who was able to secure from the Government proper consideration and assistance. He saw the difficulty of the proposal for amalgamation at the present moment. They would have to alter the whole of the rates of pay and they would have to alter the discipline. It was necessary to think out more carefully than was possible at this moment on what system men would be taken into the Flying Corps. The flying life of a man was comparatively short; as a rule, he supposed, a man ceased actual flying by the time he was 30 years old. He felt that in this matter we must be content to go comparatively slowly provided we did go in the right direction, and he believed the formation of Lord Curzon's Committee was a step in that direction.

Speaking with reference to the committee of which he was the retiring chairman, he said the committee were told to co-ordinate the designs of machines and the places of their manufacture. It was absolutely essential that that work for both the Army and the Navy should be carried on in the same building, but that arrangement was negatived. He was able to secure one small advantage, as he hoped it would prove, to Lord Curzon. Sir David Henderson, who met him in every possible way, at his request got the Army Council to appoint a committee, with Sir R. Burbidge as the chairman, to inquire into the working of the air factory at Farnborough. Notwithstanding that he was chairman of the committee, he could only get that committee of inquiry appointed by the good will of Sir D. Henderson and the Army Council, although it was essential that the matter should be inquired into. He hoped the House would realise that he did not resign without feeling that it was impossible to keep such a position without explaining personally to the nation how powerless he was to perform the duties which they believed him to have undertaken. The chief difficulty which it seemed to him that Lord Curzon would find was that no definite Air Service policy was laid down for the Army and for the Navy. Until this was done it was impossible to provide an efficient service. He hoped that his noble friend, as a member of the Cabinet, would be able to secure such a definite policy to which the Army and the Navy could work with the energy which all knew that those services could display. This House had not had the advantage of hearing an exact statement of the position of all the members of the new Committee; but it seemed to him that what happened to the Committee of which he was the chairman was happening to Lord Curzon's Committee, and that the War Office was getting more power upon it than was the Admiralty.

Earl Curzon said it was one of the conditions of the composition of the Board that the senior representative of the Admiralty was to be a member of the Board of Admiralty, just as General Sir D. Henderson was a member of the Army Council. It was in that capacity that the Third Sea Lord, Rear-Admiral Tudor, attended a meeting of the Board yesterday.

The Earl of Derby replied that he had understood from the statement made in the House of Commons that the representative of the Admiralty was to attend the Board of Admiralty only when air matters were discussed. If there was equality of power between the Army and the Navy in this matter one of the objections which he felt was to a great extent removed.

Lord Crewe's Reply—The Marquess of Crewe: It seems almost to have been implied that the Government has shown and is continuing to show complete and most unworthy indifference to the future of the Air Service. My noble friend who spoke last gave us, I think, rather more credit for doing our best to bring about as much improvement as we can, in particular, by the appointment of a new Air Board with Lord Curzon to preside over it. As regards the composition of that Board, one or two points ought to be made clear.

Lord Montagu spoke of the position my noble friend would be placed in if he did not agree with the other members of his

Board. My noble friend cannot be placed in that position. This is not a Board that votes; it simply advises my noble friend. If he disagrees with them, he has his own way. It is, of course, possible for the representative of one of the departments to differ with my noble friend. But there is no question of my noble friend being outvoted, and it is therefore not true to state that he is not master in his own house. He is not master in other people's houses—the War Office and the Admiralty—but so far as his own Board is concerned he is supreme, subject to the appeal to the War Committee which I have already described. Lord Montagu spoke of the appointment of the legally constituted Committee. That Committee was appointed in pursuance of a promise made by Mr. Tennant in order to deal with certain charges of a damaging kind against the department. I have no doubt valuable information will be brought out in the examination before that Committee. But it has no definite bearing on the work of my noble friend and the Board. This is an entirely separate matter. I have no wish to go back upon the past history of the Board. I confess I had been under the impression that Lord Montagu's and Lord Derby's resignations of their functions had been somewhat hurried and might at least have been delayed. I recognise the force of what the noble lords said. They imagined when they joined the Board that their functions would be of a more far-reaching character than proved to be the case.

As to our policy, so far as I am able to apprehend Lord Montagu's point of view, he seems to base the notion of lack of policy on the fact that the whole Air Service is conducted by two separate departments, and not sufficiently unified. I think it is important not to ignore the example of other countries. What has taken place in France? An Air Ministry was formed, but the plan was subsequently abandoned in favour of a return to a military director. As to Germany I am imperfectly informed, but my information is that in Germany, whose conditions, I take it, are more parallel to our own than those of any other country, the two Services are kept entirely distinct, working, no doubt, with a certain degree of co-ordination, but not, so far as I know, under one common authority except in so far as they are under the Emperor himself. As to a completely unified service, Lord Derby does not take the same view of its advantage as Lord Montagu does. He sees the practical difficulties in getting anything like complete unification. There is the question of the formation of an entirely new *personnel* where men cease to be soldiers or sailors, with the loss of pension rights and of personal opportunities which are open to men who have served in the Army and Navy. These questions are obviously of very great difficulty, and it certainly seems at first sight that to attempt to solve them in the middle of the war would be an act of great rashness.

Difficulties in ordinary peace times would attend the attempt to increase our air fleet on a very large scale. Whilst willing to pay a certain sum for national defence, people would not pay an unlimited amount. If my noble friend's visions were realised and the Air Service became the prime object of attention for purposes of national defence, both the War Office and the Admiralty votes might suffer. It is not possible for us to accept the motion, the terms of which suggest something considerably beyond what the Government have done in creating new power.

Lord Northcliffe said: I should not trouble your lordships at so late an hour did I not feel that in all these discussions we have lost sight of the urgent need for speed in these matters. I am sure, however, that this somewhat shadowy Board must develop into an Air Ministry. As one noble lord remarked, "It will come from outside pressure." Personally, I have criticised the composition of this Board, but I entirely agree with the noble viscount, Lord Milner, that we must sink our differences. There are several things to my mind absolutely essential for the success of the Board. The first is that it should have its own Board of Invention. At the present time, to my knowledge, doubtless owing to the great pressure of the time, inventors who may have revolutionary and beneficent schemes in their possession have to wait for weeks and for months before they can get a decision. I would earnestly suggest to the noble earl who is undertaking this very arduous task that one of the first changes he makes should be to establish his own Board of Inventions and see that inventions are carefully and quickly examined.

Another suggestion I make is that much greater encouragement be given to manufacturers. A few weeks ago I knew of a factory that was crying for work. We cannot expect to build up establishments to enable us to cope with the comparatively small German output—small by comparison with what we shall certainly require—unless the Government offer financial assistance to worthy manufacturers able to guarantee a proper output. People talk as if we shall require 10,000, 20,000, or 50,000 aeroplanes. I conceive it must be essential, and probably before the end of this war—I take a rather longer view of the war than some—I contend it is essential that we put aeroplane construction on a footing where the new Minister will be able to get as many machines as he requires when and where he requires them. The system of construction in Germany is to give out the work in part to manufacturers all over the Empire. These parts are then assembled at great central factories, with the result that each part of an aeroplane is produced by a specialist. That is not the case here. We give orders for aeroplanes to numbers of manufacturers and they turn out aeroplanes as good as any in the world,

but they are produced to my knowledge more slowly, and I should imagine at a greater cost. The system of central assemblage of parts is one that is adopted in almost every great manufacturing industry of the world, and I think it is essential to the aeroplane industry.

Yet another suggestion I may be allowed to make is better and increased provision for the training of flying men. This is the time of year when men can be taught flying in the greatest numbers, and in half the time that is required in the windy months of winter. I think it so urgent that we should increase our flying men, and as rapidly as possible, that I think we ought to adopt the policy inaugurated by the practical inventors of the aeroplane, who, when they came to Europe and found ours a difficult country to fly in by reason of the wind, took a careful look round the likely places in Europe and settled to teach Frenchmen to fly, and chose Pau, close to the Pyrenees, because they knew it was almost the most windless place near any great military centre. I believe if we defer the training of large bodies of men till the autumn and winter we shall be lamentably short next year, when there will be a great need.

May 24—*Lord Curzon's Position*—Viscount Galway resumed the adjourned debate on the motion of Lord Montagu, and expressed cordial agreement with the main lines of the speeches of Lord Montagu and Lord Derby.

Lord Grimthorpe, criticising existing arrangements, said that the senior officers in the Service necessarily had not the same practical experience as the junior officers, and had not had proper training. This incapacitated them from taking intelligent command. They were transferred from duties they knew into a service of which they had little knowledge, and were put in command over the heads of other people who had the knowledge. There resulted friction, misunderstanding, and inefficiency.

Lord Beresford said that everything connected with the Air Service or with the scientific side of it ought to be under the Board, and it was clear it should be able to buy its own material, make its own designs, do all its own construction, and have the entire training of the three people—the pilot, the observer, and the artisan—who were necessary for every aircraft. He thought the Board was very much on the lines suggested by Lord Montagu's motion; certainly it was a distinct move in the direction he indicated. He urged the Board to scrap all useless machines. You might have a thing to-day which would be obsolete in four months' time. We began badly, ordering an enormous number of machines without trying them. We had ordered 850 Curtiss machines at the cost of over a million and a half, and no date was mentioned for delivery. He asked what had become of the Handley-Page type of machine and the Sparrow. They ought to be scrapped at once. He hoped the Government would show foresight, at last, in the matter of the Air Service. Let them begin by making out the respective duties which the Army and the Navy had to do; train the Air Service as a whole and then draft the men into the Army and the Navy as required; get the best designs possible and prove the worth of the machines before ordering so many, as was the case in the past; and then, he thought, we would be as predominant in the air as we were on the sea.

Lord Haldane Moralises—Viscount Haldane said the moral of the whole situation with which the country was confronted was the consequence of the neglect of the maxim, "Think first before you act." There was a good deal of talk about the application of science, as though we could go to somebody for ready-made ideas and then use them. It was trained minds that were wanted. He was glad the Government had taken the course not of setting up an Air Ministry, which had to do something without knowing distinctly all that it had to do, but a Board which was to survey the ground and determine what were to be the functions of the Air Service. He entirely agreed with what had been said as to the tremendous importance which the Air Service would assume in warfare. But that would not arise in the course of the present war. It was a matter of the not far distant future. The first duty of the Board should be to determine what kind of machines should be used and the quantities in which they should be ordered.

Lord Northcliffe had said yesterday, very truly, that there was a great waste in one manufacturer making all the parts of a machine, and that the parts should be distributed. He thought that was very important. As regarded various parts, there was much that could be standardised provided they knew exactly what the part was. Having been War Minister, he could have wished that progress had been quicker. But the want of ideas and of scientific knowledge at that time was appalling. He saw some very distinguished inventors, including the brothers Wright. Whilst he admired the skill of Messrs. Wright, he saw that their machine no more than any other was based on accurate, extensive scientific knowledge. He read specifications by the pound and saw the best people we had in those days. He was driven to despair. What he saw was purely empiricism. One of the things this Commission might bring to light might be how responsibility ought to be apportioned.

As regarded aeroplanes, as far as he could gather, he could not admit that progress had not been rapid. But in airships we had been miserable. Why? The Navy was magnificent in the construction of its ships, because it had a long tradition and a great accumulation of scientific knowledge on the subject. But it knew nothing of airships. When it was decided to hand over lighter-than-air ships to the Navy, the Navy was totally unpre-

pared to deal with the situation. As to an Air Ministry, it was not enough in dealing with these matters to want to do something. It was also necessary to know what to do. Unless we knew what science we had at command and how to make the best use of it, satisfactory results would not be attained. He hoped the Air Service was going to teach the country the practical value of science.

Lord Curzon's Reply—Earl Curzon: I was very glad to hear Lord Derby and Lord Northcliffe speak in high terms of the natural aptitude shown by British airmen for service in the air. I think that anyone who has studied the debates in this and the other House will have arrived at the conclusion that the Air Service is one of which the nation has every reason to be proud. From almost humble beginnings at the commencement of the war it has risen to very formidable strength. It employs tens of thousands of men, and thousands of machines, and great things have been accomplished by it. In initiative, enterprise, and courage our aviators are second to none in the world.

As regards aerial work at the front, a ceaseless interchange of aerial amenities is going on. Anyone who reads the bulletins from day to day may be convinced that our airmen need not fear comparison with German aviators or any others. A daily series of almost Homeric combats are going on in the air, each one of which deserves almost a chapter in an epic. In these combats our men are showing that the mastery of the air—a phrase which I particularly dislike, and which I shall use as little as possible—that the mastery of the air is a thing that oscillates from side to side, and if it expresses anything at all, rests as often, if not oftener, with our men as with the enemy. As regards the defence of our own shores, if the enemy has not desisted from these murderous raids—and though he may be contemplating something bigger—yet at the same time it cannot be denied that the defences both of London and the country are much more formidable than they were a short time ago.

So much for the past. There remains a great deal to be done, particularly on the administrative side, both in co-ordinating effort, in supplying machines, and in the organisation of material. Here we come to the application of scientific knowledge to the practice of this arm of war. That is a branch of the work with which I shall be concerned. On the last occasion when the question of the air came before your lordships' House, an attempt had been made to introduce greater co-ordination into our system, to prevent the competition and overlapping known to exist between the two great fighting departments, and particularly in regard to design and supply. I entirely agree with the two members of that Committee who addressed your lordships last evening—I refer to Lord Derby and Lord Montagu—I entirely agree with them that the Committee was hampered from the start, and, in my belief, foredoomed to failure by the exceedingly restricted nature of the reference. After meetings on several occasions, extending over a period of some weeks, the two noble lords retired, but I should not like your lordships to carry away the idea that Lord Derby's Committee did nothing; on the contrary, it accomplished real and valuable work. They did a great deal of useful work and cleared away many misunderstandings. It seems to me, from the report of their proceedings, that Lord Derby was always seeking to guide the Committee in the right direction and that the Committee was always hovering on the brink of larger decisions. I agree with Lord Derby that it was more than doubtful whether the Committee was empowered or expected to discuss policy. It certainly had no effective authority to arrive at a decision. It was in these circumstances that the Government were called upon to review the situation and to find a fresh solution. Several alternative methods of procedure were before us. It would have been possible, but I think it would have been futile, to reconstitute the Committee under another chairman, with a slight expansion of powers and perhaps another name. It might have been possible, but I think it would have been inexpedient, to revert to the *status quo ante* and to dispense with the Committee or a board altogether. In that case the defence of the existing system would have rested with the two departments, as it has hitherto done, and here let me say in passing that I think that in many respects those two departments put up a much better defence of their administrative action than a good many of their critics believe. I think, moreover, it would have been impracticable, because undoubtedly the examination given to the existing system did reveal many flaws in its dual nature, and I think the knowledge that has been acquired clearly points to the desirability of appointing some external authority with time to think, with power to co-ordinate and to supervise, and with a really effective appeal to what is, in these circumstances, the final tribunal—namely, the War Committee of the Cabinet Council.

There were in reality only two solutions before the Government. One was the creation straightway of a separate Air Department with an Air Minister at its head; the other the creation of a new authority with substantially larger powers than that enjoyed by Lord Derby's Committee and much wider instructions. A noble lord asked why the Derby solution was not adopted. It was because there was not that measure of agreement between the War Office and the Admiralty which would have rendered such solution easy. It would have been, and indeed was, resisted by the Admiralty. The introduction of so large a scheme could, I am convinced, only have been accomplished at

the present time at the cost of dislocation, of friction, of the rupture of long-standing ties and associations, which would not have been desirable at any time, but would have been perilous at this stage of the war. I know that these views were taken very strongly by Lord Derby himself. Ardent reformer as he is, the undertaking of so complete a change at the present time was, in his view, not to be thought of. The utmost that Lord Montagu had to say last night for the adoption of this larger plan was that it was better to be too soon than too late. As a general proposition that is sound, but I submit that in war-time more especially, there is a mean between the two which is better than either too soon or too late, and that is just the right moment. The whole of the contention of this part of my speech is that the present is not the exact moment at which that large change should be effected.

Something has been said by noble lords about the views entertained by the Army and Navy with respect to the use of aircraft by them and of the close connection which that branch of the service bears to their work. Although I do not altogether share those views, I think it is only fair that the point of view of the departments concerned should be borne in mind. Both these departments look upon air-work as an integral part of their policy and their organisation.

There is a further difficulty in proceeding to more drastic solutions. The task of setting up a new department, with full executive authority, with large financial powers, with complete control of the *personnel* of the two branches of the Air Service, with full responsibility for contracts, design, and supply of machines, with an independent organisation and staff, would have involved very great and continuous effort in the midst of a great war, which strains every energy to the utmost, and might, I think, have exercised a disturbing influence. I would point out in passing that there is no analogy with the Ministry of Munitions. The Minister of Munitions was appointed as a Minister of Supply for a particular class of article for the Army. As Minister of Munitions he has nothing to do with strategy or policy, which marks the case off very sharply from the Air Service. Then there are practical objections arising out of pay and discipline to the organisation of a single Air Service at the present time. These are the main considerations which decided the Government against embarking on so great an experiment in the middle of a war.

An Air Department—Having said so much, I should like to add that I think such an Air Ministry or Air Department is destined to come. I see before myself, before many years have passed—it may even be sooner—I paint to myself a dream of a single service under a single head, under a single roof, with a single organisation. Such a unification I cannot believe to be beyond the administrative genius of our race. But if I am right in that, I would sooner see it come—as in the past few months I have seen military compulsion come—as the result of a concordat between all those who are interested in the matter, as the result of a cordial acceptance of the principle by both services and both departments, with the avowed support of the Secretary of State for War and the First Lord of the Admiralty. The Board which has been appointed will undoubtedly hold this consummation in view. It is one of our duties to explore the ground and to examine the possibilities of such a solution. One day it will be our business to report to His Majesty's Government on the matter, but in the meantime I think I can assure the House that we have more immediate and pressing duties to perform. For the reasons I have stated I cannot accept the motion of my noble friend Lord Montagu. It is really one, rather cleverly disguised, for the immediate creation of an Air Department.

Lord Montagu: I particularly disclaimed any idea of an Air Ministry at present.

Earl Curzon: If I may take the terms of the motion, my noble friend is really proposing that there should be no longer divided control or responsibility of two separate departments, and that both men and material should at once be concentrated under one control.

Lord Montagu: For the purposes of supply.

Earl Curzon: I would really ask the noble lord to consider the position of the Board and myself in the matter. He has told us that he means to give us his support, that he does not want to embarrass me, and at the same time he is going to ask us to vote for a motion which practically condemns the organisation of the department for which I am responsible, and pronounces in favour of a revolution which for the reasons I have given it is impossible at the moment to carry out. If the noble lord carries his motion to a division, I shall ask the House, out of regard for the work which we have undertaken in circumstances of great difficulty, to be kind enough not to follow him into the lobby.

Functions and Composition of the Board—The Board differs substantially from Lord Derby's Committee in composition, intention, and in powers. It is directly charged with thinking out and formulating a policy and making recommendations to the War Committee of the Cabinet. For those reasons it was decided that the Board should have as president a Cabinet Minister, not because a Cabinet Minister knows more—many people think he knows less—than other men, but because a Cabinet Minister would be able to examine impartially and arbitrate between the claims of the two departments, confer on

equal terms with the Parliamentary Chiefs of those Departments, take his case into the Cabinet and argue it, if desired, and in the last resort have it appear on the schedule of the final court of appeal, the War Committee of the Cabinet. It is not a post which any public man would welcome, and I venture to think it is not a post which any public man could refuse. I am bound to say that among the correspondence I have received since my acceptance of the office there are far more letters of condolence than of congratulation, and I feel I shall need all the sympathy and support I can get. Mr. Churchill predicts that the future of the Board will either be one of harmless impotence or a continuation of first-class rows. At all events, one chance of disturbance has been eliminated by the disappearance of my right hon. friend from the ranks of the Government. For had I come into collision with a Minister of so vivid a personality, with so great an interest in the Air Service, and with such memories of contributions to that service by himself as are enjoyed by my right hon. friend, I shudder to think what might have been my fate.

It has very naturally been pointed out that I do not possess and cannot claim any special knowledge of the air. But if that be the test applied, I err in good company, because it is not the test we have ever applied in this country to ministerial or departmental administration. Whatever my disqualifications are, in interest and enthusiasm in the work of the air I am second to none. Ever since the beginning of the war I have felt convinced that the Air Service has a great feature not merely in determining the issues of the war, but in the part which it will play in the defence of this country and in the warfare of the future. I believe the time will come when the air arm will play a part in warfare scarcely conceivable now.

I am asked to say something about the composition of the Board. It was decided there should be placed on it two representatives respectively of the Admiralty and the War Office, and in order that those representatives should speak with the highest authority on behalf of their departments it was decided that the senior officer representing the Admiralty should be a member of the Board of Admiralty or attached to the Board of Admiralty for the purpose; and that the senior military representative should have a seat on the Army Council. Accordingly the two representatives of the Admiralty now sitting are the Third Sea Lord, Admiral Tudor, and Admiral Vaughan-Lee. The two representatives of the War Office are Sir David Henderson, Director-General of Aeronautics, and General Brancker. Then there are the independent members. I should have been very reluctant to accept the office had I not had the advantage of the co-operation of Lord Sydenham. I cannot say how fortunate we are to have obtained the services of a man of such wide experience in varied capacities. The representative of the Board in the House of Commons will be Major Baird.

We have secured a habitation for ourselves in close proximity to the Admiralty and the War Office, No. 19, Carlton House Terrace. There a modest secretariat has been established, the chief of which is the permanent secretary, being a very capable civilian, Sir Paul Harvey, who has had service in India, the War Office, Egypt, and elsewhere, and as assistant secretary to him there has been nominated Commander Groves, who has an almost unique experience of flying on the naval side, and who has been brought back for the purpose from Dunkirk, where he had been the right-hand man of Admiral Bacon.

I am glad Lord Northcliffe is to be one of the first to place his views before us. Lord Montagu is going to do the same. Lord Haldane is going to do the same. I hope we shall at once establish contact with all authorities and experts, and we shall take the earliest steps to get into communication with scientific bodies. One of our instructions is to get into touch with various bodies of inventors who have been experimenting since the war broke out, and we shall regard as one of our foremost duties the exploration of the path of invention.

As regards the powers of the Board, and perhaps more particularly the chairman, Lord Montagu drew last night a rather distressing picture of what would happen if the chairman disagreed with the Board. The Board is intended to be an advisory board. No question will be decided by voting. The situation therefore cannot arise in which the president will be overruled by his colleagues, nor indeed can a situation arise in which the Admiralty and the War Office will vote against each other or come to a direct issue. What, I take it, will happen will be this. The president, acting in close consultation with his colleagues, will endeavour to arrive at decisions on various subjects. If the representatives of the Admiralty or the War Office on the Board feel that the decisions to which he comes are inconsistent with the prerogatives, functions or conception of duty entertained by their departments, there will be nothing whatever to prevent them from acquainting the Army Council and the Board of Admiralty with the matter, and if they find their action is supported by the Secretary for War and the First Lord, I imagine the next step will be for these high officers to discuss the matter with the president of the Board. In the event of their not agreeing, the reference to the War Committee, the final court of appeal, will take place. The procedure is simple and ought not to be productive of friction if worked with a reasonable amount of tact. It is sufficiently elastic and not tied down too closely by narrow rules of operation.

We shall exert ourselves to continue the work already begun

by Lord Derby's Committee in preventing rivalry and overlapping between the two departments. Then our desire is to examine—indeed, we have already commenced—one by one such questions as the position in respect of machines and men at the front and in the various theatres of war, the organisation of long-range offensive operations, the defence of this country by aircraft and guns against hostile aeroplanes, the use and development of lighter-than-air machines, the supply of the best types of aeroplanes and engines, the armament of aircraft, national air factories, new inventions, and provision for flying grounds and training facilities. Those are the questions which I think we shall attempt to examine at a very early date. Arising out of these will, of course, spring the necessity for attempting to formulate a policy for the two Services and the two departments and providing them with machinery to carry that out.

I pass to a rather more remote category of questions. In the background we shall certainly hold in view, though I think it would be unwise to pronounce upon them until we have acquired a good deal of experience, such questions as those named by Lord Derby last night—the possibility or desirability of the amalgamation of the designing and contract branches; also of the respective staffs of the two departments, the formation of a national air service, and the institution of a joint national factory. Those are questions on which it would be absolutely dangerous for the Government to rush to a conclusion. In the farther background there would always be looming the question of the possibility or desirability at a future date of creating a single department under a single Minister.

I hope noble lords will not expect too much of us. The Board is an experiment, but it is a sincere and honest experiment which its members mean to turn, so far as they can, to the best account. I solicit the support of the two great departments of the Army and the Navy, with whom the Board have neither desire nor object in coming in any way into conflict, whose battles we shall in many cases be fighting ourselves, and whose interests we desire to serve. Finally I ask the sympathy both of the experts who know so much and of the public at large who know so little in the endeavour to make the Air Service one which will not merely contribute to success in the war in which we are engaged, but shall be a potent instrument of national strength in the future.

Lord Montagu's Reply—Lord Montagu: The debate has been very useful, even if it has done nothing else than produce the very clear speech of Lord Curzon. His difficulties in administration will be greater, I think, than he anticipates. I am afraid I cannot take quite the same hopeful view of his relations with the Admiralty and the War Office that he takes. Perhaps he may be successful if he remembers the Roman maxim, *divide et impera*. If he can get one department on his side he can probably carry his point. Letters which have been received show that a bad state of things still exists. I have been given a letter from a young officer which shows what a heartbreaking state of things these young officers sometimes have to meet. I will read, though I could not approve all his words. He says:—

"The machines left Gosport last Saturday—twelve in number—at the present moment three remain intact. They set out for Dover in fine weather. One blew off a cylinder head, which crashed through the planes, shortly after starting, but it managed to struggle to Shoreham on the other eight cylinders and landed safely. Another developed engine trouble and turned back, but had to land on the way and was smashed. A third had engine trouble farther afield and, landing on unfavourable ground, was wrecked completely. A snowstorm overtook a fourth, which was also damaged—extent unknown. Three more had engine breakdowns—two being entirely 'done in,' but the other was more successful and only smashed the under-carriage. An eighth arrived at Dover without trouble, but was smashed to atoms on landing. This was our best pilot, too. He is in hospital now! Four landed safely at Dover and crossed the Channel next day. Three of them got to G.H.Q. without mishap, but the other dissolved itself into a heap of wreckage in the middle of the aerodrome! So that's that! Twelve started—four arrived—three only are still able to fly! Two, possibly three, can be repaired. The rest are gone for ever, and one pilot (the best) in hospital. Oh! listen to my tale of woe! Heaven knows what will happen to us now—poor old 29! Perhaps the 'powers that be' will begin faintly to realise what the youngest subaltern in the R.F.C. has known all along—viz., that a certain engine is no good."

As to the *personnel* of the Committee, I understand that Admiral Tudor, the Third Sea Lord, is one representative of the Admiralty, and that the other is to be Admiral Vaughan-Lee. Without wishing to reflect upon either of them, I am sure that they would be the last to claim any knowledge of aviation, and I suggest that, at any rate, one of the representatives of the Admiralty should have such technical knowledge. General Sir D. Henderson has technical knowledge; but about him there is this anomaly, that he is General Officer Commanding the Royal Flying Corps and at the same time a member of the Army Council. It is an unusual combination of positions, for he has to do both the thinking and the administrative work. I suggest that General Henderson is already very much over-worked, and that the Government should let him do one thing or the other; I think it is impossible for any man to do both perfectly. The Army Council, I am given to understand, is one of the delightful

fictions of our administrative life—one of the phantoms which is said to exist, but really does not. It is said to meet very rarely. Sir David Henderson may be to the Army Council what the Archbishop of Canterbury is as a member of the Board of Trade—he may add moral weight to it and act as a sky pilot.

The expenditure on aviation is unlike money lost in war. Millions of money have been spent upon guns, ships, and munitions, and most of the expenditure on war is utterly wasted and is for the destruction of mankind. The expenditure on aviation in war will accelerate the progress of aviation generally, and is therefore not only for the purpose of destruction, but will be for the benefit of humanity afterwards. That is an important point of difference.

In framing my motion I particularly excluded from it any mention of Ministers. It asks for the co-ordination of the supply of men and materials for the Air Service under one head. It goes little, if at all, farther than the noble earl himself proposes, and I think the House will do well to place on record the opinion which it expresses. I shall, therefore, divide the House, even if I find only one noble lord to act as a teller with me.

The House was then cleared in order that a division might be taken; but before the question was put Lord Montagu said he found that the sense of the House was against a division, and he would withdraw the motion. The motion was by leave withdrawn.

HOUSE OF COMMONS

May 22—*The Air Service Committee*—Mr. Asquith, in answer to a question by Commander Bellairs suggesting that, in the public interest, the Royal Flying Corps Committee which was appointed to investigate the charges made by the hon. member for East Herts, should be instructed to present an interim report, and asking whether the Government would so amend the terms of reference as to empower the Committee to decide if it would be in the public interest to proceed farther with its investigations during this critical stage of the war, said: The Committee are fully alive to the desirability of saving the time of General Henderson and others as far as this can be done without prejudice to the inquiry. I understand that there are other charges, covering to some extent the same ground as those made by the hon. member for East Herts, and all these matters must receive full investigation. While the submission of an interim report is not impossible, it is not considered likely that by that means any appreciable saving of the time of Sir C. Henderson or of the officials or officers of his department would be effected. The terms of reference do not, I think, require any amendment, and, now that the inquiry has been started, it is not intended that it should be concluded until all the charges made have been investigated.

Mr. Billing (Ind., Herts, E.): In view of the fact that the Committee has proved a farce, will the right hon. gentleman give the House an assurance that a properly constituted Committee will be appointed to investigate the charges?

Mr. Asquith: A properly constituted Committee has been appointed, and those who have charges to make should make them before it.

May 24—*The Air Board*—Major Baird (U., Rugby), in reply to Mr. Joynson-Hicks (U., Middlesex, Brentford), said the exact powers to be exercised by the Air Board over services or establishments still under the control of different departments could not be defined at present before the Board had begun its work. The question must depend very largely upon departmental arrangements and developments. This House would have opportunities of criticising the Air Board's expenditure on the votes of credit.

THE AIR ENQUIRY

The second meeting of the Government Committee met at Westminster Hall on May 25th. General Sir H. Smith-Dorrien was present for the first time. Mr. Joynson-Hicks, M.P., was under examination during the whole of the sitting, and towards noon Mr. Pemberton Billing, M.P., put in an appearance.

Mr. Joynson-Hicks said he had always maintained that we had not in any way the mastery of the air, though it had been stated in the House of Commons by Mr. Bonar Law and Mr. Tennant that we had a very large supremacy in the air and that our aeroplanes were better than the German ones. He had mentioned at the last sitting that he had communicated with a very large number of officers on the matter. Though the majority of these did not wish their names mentioned, for obvious reasons, there was one, Major George Lane-Fox, M.P., Yorkshire Hussars, who had no such objection. Writing from the Western front on February 10th, this officer said "I should like to tell you how regularly the official reports from France seem to lie as to our supposed mastery here. This mastery may prevail elsewhere, but it certainly does not at this particular spot." Major Lane-Fox subsequently wrote stating that he believed that things were very much better, there had been great improvement, and we really seemed to have the advantage over the Germans.

Mr. Joynson-Hicks suggested that someone should be allowed to go out and report on the condition of things. He then read extracts from letters from officers at the front in regard to the Fokker and other machines. An officer in the Flying Corps who had received the Military Cross wrote on February 18: "We have not got the mastery of the air. We have the pluck, but we have not got the machines, the organization, or anti-aircraft guns of any value." That officer also told him verbally that the bulk of the machines were too slow to cope with the German fast machines.

The witness next quoted the following passage from an official report issued by the Intelligence Department: "The Fokker when in action seeks, by the exercise of its superior speed and climbing powers, to obtain a position above its adversary." That, he submitted, was an official admission that the Fokker had superior speed and climbing power. He had always contended that the difficulty we had in getting fast machines had been a lack of powerful and better engines. That, he submitted, was admitted by Mr. Balfour in the House of Commons on November 11, when he said: "We are making as hard as we can aeroplanes, we are making pilots, and we are making guns, but we are behindhand. We have always been behindhand in this war. It has never been denied."

Mr. Joynson-Hicks said he was prepared to admit that we had now a few—a very few—machines of the fast scout type as fast as, and possibly faster than, the fastest German Fokker machine, but they were not in working numbers. They were being built to-day. Replying to the Chairman, he said he was of opinion that we could obtain absolute control of the air if we had a great number of machines. We could then carry out raids with not 20 or 30 machines, but 500 at a time. It would, he believed, be possible to force the German lines back in the way he suggested. It might cost £10,000,000, and there would be a certain loss of life, but it would be infinitesimal compared with the loss of life in a battle.

In answer to further questions, Mr. Joynson-Hicks said that many of our pilots had been asked to do too much. He added that Mr. Tennant stated in February this year that there were 835 officers and 521 civilians on the waiting list for training for pilots, so there was no shortage of men coming forward.

MR. BILLING

The Chairman then called on Mr. Pemberton Billing, M.P., to make a statement. Mr. Billing said: "I ask leave to intervene for a few moments to explain the object of my presence here to-day. In the House of Commons, acting with a full and deep sense of responsibility, I made certain definite allegations concerning the administration of the Royal Flying Corps."

"I demanded an inquiry by the Admiralty and the War Office into my allegations. The Government's reply was to set up this Committee, and, as you are aware, I have taken strong exception, and nothing so far has happened to alter my views, to the composition and more particularly to the terms of reference of this Committee. But after following the verbatim reports of your proceedings, and realizing how meagre and inconclusive has been the evidence put forward, I have come to the conclusion that I must no longer withhold even the limited evidence that your terms of reference permit me to tender if this inquiry is not to prove abortive and, what would be worse, result in a finding of 'not proven.'"

"Having exhausted every means in my power to secure that this inquiry should be full and comprehensive, even to the point of refusing to appear before it, I am now convinced that no action of mine will force the Government to take a more wholesome view of the position or to challenge the accuracy of the charges against the Naval branch of the Royal Flying Corps. Those charges, infinitely more serious than any charges this Committee is being permitted to investigate, must, therefore, in legal parlance, go by default. And the people of this country will naturally, in this decision as in so many other decisions which the Government have taken, not fail to draw their conclusions."

The Chairman: I gather, so far as this Committee is concerned, the net result is that you now desire to appear and give your evidence before us?

Mr. Billing: Entirely.

The Chairman: Then we will endeavour to fix a day when we can go into your charges.

MR. JOYNSON-HICKS AGAIN

General Henderson cross-examined Mr. Joynson-Hicks on the basis of statements made by the witness in Parliament. He first of all asked as to the origin of such terms as "mastery of the air," "supremacy in the air," "superiority," and so on. "The Flying Corps, you know," he said, "has never claimed the mastery of the air."

Taking the various proposals made by the witness, such as that along the East Coast we should have air stations at every 40 miles, and at each station 40 machines, and 2,000 aeroplanes for bombing purposes, General Henderson asked the witness if he thought it was a physical possibility to have got the necessary number of men. Taking the witness's own figures, Sir David estimated that we should have wanted 1,680 pilots and 24,500 mechanics.

Mr. Joynson-Hicks said he thought it was desirable to have that number.

General Henderson: It is the actual physical possibility I want to get at.

Mr. Joynson-Hicks: In all probability you could not at the rate you were going have made 1,600 pilots at the time I made that speech.

General Henderson: I want to find out whether these statements are directed against the administration of the Flying Corps or whether they are pious aspirations.

Mr. Joynson-Hicks: They are distinctly pious aspirations, and if I had been the Air Minister I should have said to you at once "How near can we get to those?"

General Henderson: Since the war began I have accepted full responsibility for what has been done. I have not been hampered, and that is why I am anxious to get these things cleared up. Do you suggest there has been no real development of the Air Service?

Mr. Joynson-Hicks: There has been no material change in the working of the main conception of the service.

Referring to a complaint that an officer had been sent to France

after six weeks' training and five hours in the air, General Henderson said he had searched the records and the only officer who had been sent out after six weeks' training was an officer who had had more than five hours in the air as a pilot, and had had considerable experience as an observer previously. Every new officer who went out to France was tested by the officers there before he was allowed to take up the service.

Answering further questions, Mr. Joynson-Hicks remarked that the management of the Flying Corps before the war did not encourage English manufacturers, and the result was that we had to buy from France at the outbreak of war.

Do you know that France bought from Italy, and Germany bought from Holland?—I do not know.

You know that there was a certain Mr. Fokker who was useful to the Germans?—Yes. I have heard it said that he might have been useful to us.

[The query with the implied suggestion which it carries is absolutely incorrect. Germany, needless to say, never bought from Holland. Fokker is a Dutchman who was domiciled in Berlin long before the war. His factory, purely a German one, was supplying the German Government long before the war. The suggestion, if seriously meant, that France bought from Italy anything but purely experimental types or unimportant parts is simple ridiculous.—ED.]

The witness further suggested that on nights when aerial attacks were imminent at least two machines in each aerodrome should be in readiness to ascend, the engines being kept warm.

Sir David Henderson pointed out that no fighting machine was fitted with a R.A.F. engine, and that it was extremely necessary that engines should be tried before machines were started, as most of the accidents occurred through engine failure when leaving the aerodrome. In regard to the question of a patrol, that was a matter of expenditure. He proposed to call a great many pilots to see whether they agreed with Mr. Joynson-Hicks. He disagreed with the witness in his view that we had simply followed the Germans in regard to engine power.

Referring to a suggestion that aeroplane makers were left with insufficient orders, Sir David said that if the witness knew of any aeroplane maker who was short of work just now he should be very glad to know who he was.

The Witness: May I make a few inquiries on that point and let you know?

Sir David: I shall be very glad if you will.

The witness added that the general complaint was that orders were not given in larger quantities to enable manufacturers to put down their plant for them.

The inquiry was adjourned.

LORD MONTAGU

The Judicial Air Committee resumed its inquiry on May 26.

Lord Montagu of Beaulieu explained that his criticisms were constructive and that he had made no personal charges against the Flying Corps. He had prepared a general statement, which he would read, but as to the second statement which he would submit, he was not quite sure whether it would be wise to publish it.

Lord Montagu then read his statement, in which he said:—

"In 1909 the Wrights originally offered their invention to the War Office for a comparatively small sum of money—I believe—but were told that they and their invention were not wanted, and from October, 1908 (the date of flights at Le Mans—the first in Europe—by Messrs. Wright) to 1911 but little official attention was paid to the development of aviation. I attended those flights, and was at once convinced of the importance of aviation from a national point of view. In February, 1911, when I lectured on military aviation at Aldershot at the Military Society, with General Sir H. Smith-Dorrien in the chair, that officer was almost the only one in high command who had vision enough to realize the coming possibilities of the aeroplane and the rigid airship. When General (then Colonel) Seely was at the War Office he claimed, in May, 1913, to have 101 aeroplanes for the use of the Army. I challenged his statement, and said that in my belief there were only 46. General Seely asked me to go and see him about this, and after some conversation he asked Sir David (then Colonel) Henderson to come in. Sir David Henderson then produced a list of aeroplanes at different aerodromes, and gave his word that this list was correct. I did not trouble, therefore, to count them in their hangars, but accepted his word. It has since come to my knowledge that the statement I made was essentially correct, and although there were 101 in number, only 50 could really fly at that moment, which was, of course, what I meant by my statement. But on the occasion referred to I believed the official figures, and therefore I thought that it was only fair to state publicly afterwards that Colonel Seely had proved I had been misinformed. That incident was instructive, and characteristic of many Government statements."

"In 1909, 1910, and 1913, in particular, I made speeches in the House of Lords, copies of which I now lay before the Committee, and constantly wrote and spoke about the urgent necessity for more attention being paid to the subject of aviation by the Government. But my warnings fell on deaf ears; I was assured by the Government that everything possible was being done, but it was with the greatest difficulty, as Sir David Henderson knows, that proper provision for the R.F.C., small as it was in those days, could be secured. I would remind the Committee that it was originally only one corps, with naval and military branches."

"As regards the Navy, Commodore Sueter and others through these years were trying to induce the Admiralty to consider the possibilities of aviation, especially with regard to rigid airships. He also failed to convince his Board, and after one unsuccessful trial at Barrow

—almost the windiest spot in the British Isles, from the meteorological reports—the building of airships was abandoned.

“Notwithstanding this, the *personnel*, though small in numbers, was magnificent in quality, and at first they piloted the B.C. 2 C. machine with much success. Originally it was equipped with a 70-h.p. Renault engine. Eventually the 90-h.p. R.A.F. engine was fitted, and shortly after the early stages of the war the B.E. 2 C. proved its superiority, and during the first year of the war it may be said that hardly any German machine dared fly over our lines, for we had attained a certain amount of ascendancy, chiefly due to our pilots' skill and pluck.

“After last summer, however, a gradual change began to take place; more powerful German aeroplanes appeared, and the German pilots became more skilful. From that time to now, unless the information which I gathered personally at the front in October and November last, and which is reaching me constantly from the front from many pilots, brigadier and divisional commanders, and other officers, is all incorrect, we are still at a disadvantage. I am glad to be able to tell the Committee, however, that I believe our disadvantage is now decreasing, so far as I am able to judge.

“There has been a great deal of criticism of the Royal Aircraft Factory, some of which is, I think, unfair, but much of which is sound. Instead of being, as it was originally intended to be, a small Government establishment, to be used chiefly for experimental and research purposes, it has developed into a big manufacturing concern. I think it is a mistake to have allowed this to take place. I regret to tell the Committee that the majority of manufacturers of aircraft engines and accessories, on whom the country has to depend so largely for its supplies, regard the R.A.F. with suspicion and dislike. Through fear of losing contracts or being victimized, managers or constructors are unwilling to give evidence, but I think the Committee should know that the feeling exists and that it is to be deplored in the national interests.

“Colonel O'Gorman, the chief of the R.A.F., and his staff are also placed in the ridiculous position of being competitors and judge and jury, and being Government designers and manufacturers and at the same time critics of other people's designs and manufacture with whom they compete. They are thus in an impossible position. If, for instance, an engine of better design than theirs is submitted, and even if it is proved to be better by experiment at the R.A.F., it is difficult for the factory to acknowledge officially the inferiority of its own work, and it should not be put in this false and impossible position. The naval system is better. They get a machine wherever they can, and the aircraft trade is co-operating very cordially with them. The R.A.F. is more a manufactory than a school of research.”

AIRCRAFT IN ACTION

OFFICIAL INFORMATION

ENGLAND

May 22—Aircraft Activity—Yesterday (May 21) the enemy aeroplanes were active. Many were engaged by our machines, and eight were driven off, though none was brought down. During the day one of our reconnaissance machines was forced to land in the enemy's lines.

May 23—Enemy Aeroplane Driven Down—Hostile aircraft active on portions of our front yesterday (May 22). Fourteen enemy aeroplanes were engaged and one was driven down inside the enemy's lines in a damaged condition.

May 28—Aeroplanes' Useful Work—Yesterday (May 27) our aeroplanes, taking advantage of the fine weather, accomplished much useful work. Hostile aeroplanes were inactive.

FRANCE

May 22—French Air Squadron's Raids—In the region of Verdun our aeroplanes attacked German captive balloons. Six of these balloons were brought down in flames. In the course of an aerial fight one of our pilots brought down a German aeroplane in the region of Les Eparges. Two other enemy machines attacked by our aircraft fell and were wrecked—one in the enemy's lines near Liancourt-Fosse, near Roye, the other in our lines at Fontenoy, west of Soissons. This morning (May 22) enemy aeroplanes dropped bombs on Dunkirk. During the night of May 20-21 several operations were carried out by our bombing squadrons. Bombs were dropped with success on the railway stations of Metz-Sablons, Avricourt (north-east of Lunéville), and Roye; the munition depots of Biache and Chapelotte; the bivouacs in the region of Azannes and on the village of Jametz (both north of Verdun), where a high commander's post is established. Two of our airships plentifully bombarded the railway stations and the permanent ways at Brioules and Dun (also in the Verdun region).

May 22—German Aeroplane Brought Down—Paris.—This morning (May 22) one of our chaser-planes sent in pursuit of one of the German machines which had just bombarded Dunkirk encountered and brought it down at Wizele (north-east of Cassel). In Alsace two enemy aeroplanes were forced down in an aerial fight. One fell into our lines at Senthem (south of Thann), the other in the region of Bonhomme, close to our trenches.

May 24—Two Enemy Machines Brought Down—In the region of Furnes a German machine, shelled by one of ours, was brought down in our lines. Near Beaumont an Aviatik, which was badly hit in the course of an aerial fight, fell in the enemy's lines. In the region of the Linge one of our pilots, attacked by three enemy aeroplanes, brought down one of his adversaries and put the two others to flight.

May 25—Fokker Brought Down—In the course of a fight in the air one of our pilots brought down a Fokker, which fell in the enemy lines to the north of Vaux. In the region of Etain one of our air squadrons engaged a group of German machines, two of which were badly hit and compelled to land.

The Chairman: To what is this atmosphere of suspicion due? Is it because the R.A.F. is a competing manufactory?

Lord Montagu: That is one of the reasons. It is not my business to defend the trade, and I am not making a point of it. If I should want to do so I will collect evidence on it. I think that the proper attitude of the R.A.F. should be to encourage private manufacturers and establish confidence in the trade.

Mr. Bright: How does the R.A.F. not encourage private enterprise?—I must decline to go any further into the trade question. If you wish me to elaborate that question I will do so.

Mr. Bright pointed out that this was the only opportunity officials had of meeting the statement, and asked if manufacturers would be willing to give evidence before the Committee.

Lord Montagu did not think they would do so, as they were afraid of being victimized. No doubt the Press would take note of the suggestion, and the manufacturers would see it.

General Henderson: Do you propose to bring evidence of private designs being submitted to the aircraft factory?

Lord Montagu: I am not concerned in the defence of the trade, but I say that managers and directors are unwilling to give evidence. Under the Defence of the Realm Act you have a right to three copies of every design.

General Henderson: I have, but not the aircraft factory. The statement is that private designs of firms are submitted to their competitor, the Royal Aircraft factory. I want to know if you have any evidence of that?—A manufacturer naturally has to submit his designs.

To me, but not to the aircraft factory?—Will you give me your word of honour that a design has never been taken to the factory?

I am asking you a question. Have you any evidence whatever that a private design has ever been submitted to the Royal Aircraft factory?—That is a manufacturer's question.

You have made a definite statement, which I deny as being without foundation.—There is no evidence, but that is my statement.

General Henderson: It is necessary to draw attention to this matter, because your statement goes on afterwards: “it is difficult for the factory to acknowledge the inferiority of its own work.” It puts me and the administration in a false position, and the statement must be inquired into.

Lord Montagu's second statement was then entered upon, the remainder of the sitting being held in private.

The Committee adjourned till Thursday next.

RUSSIA

May 28—Enemy Aeroplane Forced to Land—Enemy aeroplanes flew over many sections of the front. One of them was hit by our fire and obliged to land behind the town of Illuxt. In the Black Sea one of our submarines sank a big Turkish brig near the Anatolian coast under fire from the coast batteries and an enemy seaplane.

EGYPT

May 26—Aircraft's Good Work in the Sudan—War Office announcement. The following reference to the work of an officer of the R.F.C. in connection with the Sultan of Darfur's revolt occurs in the official report:—Before and during the action a valuable air reconnaissance was carried out by an officer of the Royal Flying Corps, who succeeded by means of bombs and machine-gun fire in forcing first a large body of hostile cavalry and then a body of some 2,000 infantry to retire in disorder. The officer was himself wounded by a bullet in the thigh, but returned safely to Abiad.

ITALY

May 22—Enemy Seaplane Brought Down—Enemy aeroplanes yesterday (May 21) dropped a number of bombs in the Lagarina Valley and in Carnia. There were a number of victims and slight damage was done. During a raid on Porto Guaro this morning (May 22) an enemy seaplane was brought down by our batteries.

May 23—Bombs on Venetian Plain—A number of stray enemy aeroplanes dropped some bombs on different places in the Venetian Plain. A few persons were injured, but no damage was done. Hostile aircraft were active on the Baldo.

May 24—Bombs on Stazione della Carnia—Enemy aeroplanes dropped bombs on Stazione della Carnia. There were a few victims and slight damage was done.

May 26—Airship Raid—A naval dirigible last night (May 25) dropped 28 bombs on the enemy's battery at Punta Salvore (at the entrance to the Gulf of Trieste) with excellent results and returned safely in spite of the heavy fire to which it was subjected by the enemy artillery.

May 26—Aerial Activity—Enemy aeroplanes dropped bombs on Caltravo, Thiene and Latisana, killing and injuring a number of people and doing some slight damage. One of our squadrons of Caproni aeroplanes bombarded the enemy positions between the Toara valley and the Arsa valley. On the Carso, at the height of Kostanievica, one of our aeroplanes compelled an enemy Drache (kite balloon) to descend rapidly.

May 27—Bombs on Grado Lagoon—Enemy seaplanes dropped bombs on the Grado Lagoon without injuring anyone or doing any damage. One of our air squadrons bombarded the enemy's store depots at Kötschach, in the Gail valley, doing great damage. (See Austrian official)

MEDITERRANEAN

May 22—Bombs on Enemy Ships—German official:—German aeroplanes, on May 22, attacked in the northern Aegean Sea, between Dedeagatch and Samothrace, an enemy squadron of four ships, and achieved two full hits. The enemy ships then withdrew in the direction of Imbros.

May 25—Sinai Desert Raids—War Office announcement:—Since the enemy's air attack on Port Said yesterday (May 24) and to-day he has been allowed little rest by the Royal Flying Corps. This morning (May 25) advanced posts at Rodh Salem, El Hamma, Bir Bayud, Bir Salmana, and Bir El Mazar were heavily bombed by four of our machines. Forty bombs were dropped, and had considerable effect. The buildings and plant at El Hamma were seriously damaged, while the water tanks at Rodh Salem were smashed by direct bombs. This will upset the whole plan of the enemy, as, since the destruction of the drilling plant at Jifjaffa by one of our patrols, he has set great store on the water works at Rodh Salem. During the return journey the pipe leading to the petrol tank of one of our machines was perforated by a bullet. The aviator was forced to descend in a Wadi beyond our lines, but managed to repair leak and return safely. According to the reports now received, it is evident that the column consisting of troops who suffered heavily from the bomb attack on El Arish by the Royal Flying Corps on May 18 were Germans. This perhaps explains their hasty retaliation by dropping bombs on Port Said civilians. Further details of the naval bombardment of El Arish on May 18 have been received. Two monitors and sloop took part in the attack, their accurate fire being directed by seaplanes with great effect. Altogether 34 shells were fired by the heavy guns of the monitors, two of which were observed to hit the hangar on the aerodrome, while most of the remainder burst in the camp among the tents, causing enemy to scatter in all directions.

BALKANS

May 24—Raid on Uskub—German official:—Uskub and Ghevgeli were unsuccessfully attacked by enemy aviators.

May 27—Raid on Ghevgeli—Bulgarian Official: On May 24 hostile aeroplanes dropped a bomb on Ghevgeli, south of the village of Petrove, without causing any damage. On the same morning five hostile aeroplanes appeared at Eskiye and dropped several bombs on the town and its surroundings, wounding some inhabitants. Our air squadron attacked the enemy and forced him to retire. One of the enemy aeroplanes was badly damaged, and fell in Greek territory.

May 27—Successful Air Raids—Turkish official: Two enemy aeroplanes which flew over Sedd-el-Bahr and the Straits, were chased off in the direction of Imbros by the fire of our guns. Our artillery bombarded effectively the enemy airsheds on the island of Makronisi and the covered shelters and observation posts there and on the island of Lekim. Almost everywhere where our shells fell fires broke out and explosions were observed in the shelters.

AUSTRIA

May 23—Bombs on Railway—Our seaplanes dropped numerous bombs on the railway line between San Dona di Piave and Porto Gruaro.

May 24—Bombs on Perlagarnia Station—One of our air squadrons bombarded the railway station at Perlagarnia.

May 26—Bombs on Grado Harbour—Our army aviators bombed the railway stations at Peri, Schio, Thiene and Vicenza, and our naval airmen bombed an airshed in the harbour of Grado. During the night an enemy airship dropped numerous bombs on Trieste. Nobody was hurt, no damage was done. (See Italian official)

TURKEY

May 23—Bombardment of Port Said—On Friday (May 19) eight enemy aviators appeared near the Dardanelles and dropped some 70 bombs without effect. One of our aviators twice attacked the enemy's machines. The same night our seaplanes, in pursuit of enemy aviators, flew over the Island of Imbros and dropped nine bombs on the enemy's aeroplane sheds from a height of 2,000ft. with good effect. In reprisal for the bombardment of El Arish one of our air squadrons on Saturday (May 20) night attacked Port Said and dropped numerous bombs on vessels at anchor and on the military posts in the town, causing large outbreaks of fire. In spite of the heavy firing from the enemy's vessels and the land forces our aviators returned safely.

GERMANY

May 23—Enemy Aeroplane Shot Down—An enemy aeroplane was shot down south-west of Vailly.

May 22—Raid on Dunkirk—Our air squadrons yesterday afternoon (May 21) made repeated attacks on the concentration harbour of Dunkirk with visible success. An enemy biplane, after a fight, fell into the sea. Four more aeroplanes were placed *hors de combat* within our lines—namely, near Wervicq, near Noyon, near Maucourt (east of the Meuse), and north-east of Chateau Salins. The last machine was brought down by Lieutenant Wintgens, being his fourth success. First Lieutenant Boelke shot down his 17th and 18th enemy machines south of Avocourt and south of the Mort Homme. In recognition of his performances the Kaiser has promoted First Lieutenant Boelke to the rank of captain.

May 25—Attack on British Warships—German aeroplanes attacked a number of British torpedo-boats and scout vessels off the coast of Flanders.

May 25—Two Enemy Biplanes Shot Down—Two enemy biplanes were shot down in air fights—one near St. Souplet (in Champagne) and the other near Herbébois (north of Verdun).

May 27—Bombs on Air Station—On Thursday night (May 25) a German air squadron again dropped bombs on the Russian aeroplane station at Papenholz, in the island of Oesel (in the Gulf of Riga), and obtained lucky hits, mostly on the air station itself. In spite of heavy firing, all the aeroplanes returned safely.

A German Fokker built in 1915 and captured by the French (presumably the one that landed in the French lines on March 8) will be on exhibition at the Invalides in the Court of Honour.

THE FLYING SERVICES

The following extract from an article by a special correspondent at British Headquarters was recently published:—

“May 22.

“A curious story is told me on such high authority that I must believe it to be true, to the effect that at the very beginning of the war Lord Kitchener was visiting a certain flying ground in England, watching men fly and listening to what the Officer Commanding had to say. ‘You ought,’ said the Secretary for War suddenly, ‘to learn to fly in regular formation.’ The officer replied that that was impossible because machines could neither travel far enough nor stay long enough in the air. ‘You will have to do it, all the same,’ Lord Kitchener said, ‘before this war is over.’ In the opinion of airmen the suggestion was absurd at that time, but it has come true. Both by the British and the French reconnaissance and observation work is now carried out in regular battle formation.”

SOCIETY OF MANUFACTURERS AND TRADERS

A meeting of the Management Committee of the above Society was held on May 18 when the following action was taken:—

Corps of Mechanical Engineers—On remit from the Council, consideration was given to the suggestions put forward by Mr. Berriman. It appeared that the Institution of Automobile Engineers, and perhaps other bodies, would appoint a Sub-Committee to deal with the subject, and it was resolved to appoint Mr. S. F. Edge and Mr. E. M. C. Instone as a Sub-Committee to represent the Society at any joint meetings.

STAR MAPS

To the military man a good sense of direction is of untold advantage. Many a man has found himself in the enemy's trench instead of, as he thought, his own line. Especially at night does this happen, when he has nothing but the stars to guide him. Had he any knowledge of the position of the stars, the difficulty might have been solved. To spread this knowledge a little book has been written by Mr. E. W. Maunder (late of the Greenwich Observatory), which contains a set of simple star maps, enabling one to find the compass bearings at any time of any night when the stars are visible. The book is entitled “Stars as Guides for Night Marching.” Mr. C. H. Kelly is the publisher.

SUNBEAM AERO MOTOR INSTRUCTIONS

From the Sunbeam Motor Car Co., Ltd., we have received an excellently printed, illustrated, and worded booklet giving descriptions, specifications, part numbers, and general assembling and running instructions of the well-known Sunbeam-Coatalen 8- and 12-cylinder aero-motors. The booklet is simply invaluable to anyone engaged in running a Sunbeam motor, and more especially to the mechanic in charge. It may be added that the booklet is interleaved at various sections with blank pages designed for notes and memoranda which one may care to jot down. It may be obtained on application to the Sunbeam Motor Car Co., Ltd., Moorfield Works, Wolverhampton.

NEW COMPANIES REGISTERED

BESSEMER MOTOR CO., LTD., 1, Albemarle Street, W.—Capital £5,500, in £1 shares (1,500 non-cum. pref.). Acquiring the business of the Bessemer Motor Co. as a going concern, manufacturers of and dealers in aircraft of all kinds and the component parts thereof, etc. First directors, S. H. James, D. W. Peters, and L. Wilton.

COERCEO, LTD.—Capital £20,000, in £1 shares. Manufacturers of and dealers in aeroplanes, airships, balloons, etc.

STANDARD AIRCRAFT MANUFACTURING CO., LTD., 28, Bow Common Lane, E.—Capital £100, in £1 shares. Manufacturers, inventors, designers, etc., of and dealers in aeroplanes, flying machines, airships, etc.

The A. T. Speedometer Co., Ltd., 140, Long Acre, W.C., notify having raised their list prices 10 per cent.

IMPORTS OF THREE-PLY—During the past week all restrictions imposed on the importation of three-ply wood have been removed.

AERONAUTICS

A WEEKLY JOURNAL DEVOTED TO THE TECHNIQUE OF AERONAUTICS

(FOUNDED 1907)

Edited by JOHN H. LEDEBOER, B.A., A.F.Ae.S.

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ONE PENNY

CIVILIAN FLYING SCHOOLS

AT the outbreak of war the organisation of our flying schools was lamentably deficient—if, indeed, it can be said to have existed at all. The necessity for training future pilots was evident to all who recognised the enormous wastage in this respect entailed by the exigencies and perils of modern warfare, and who consequently set themselves heart and soul to remedy the deficiency. Among such I would number Frank McClean and G. B. Cockburn, men who, in the face of all official opposition, realised the coming trend of events, saw our danger, and gave of their all—their skill, time, and money, to fill the gap and to provide against the looming danger. Without the least exaggeration, these two men, with the backing of the Aero Club, founded, and in a measure created, the Naval Air Service. And did so off their own bat. This, lest we forget.

And so it went largely with the flying schools; save only for that heterogeneous assemblage known as the Central Flying School, "sailor and soldier too," the one official training institution—which, be it added, accomplished magnificent work in spite of all its disabilities—for our supply of pilots we depended on many and multifarious flying schools established throughout the country, some from patriotic motives, a few, it is to be feared, in the pursuit of commercial gain. The result was inevitable. Each school, whatever the motives which actuated it, had its own peculiar methods of tuition, whether its primary object was to turn out thoroughly efficient pilots—a process which was commercially unprofitable—or to rake in fees from unsuspecting pupils at the quickest possible rate, with slight regard for their proficiency. The war changed all that by bringing into being a vast and gradually increasing number of naval and military training centres, whose methods of tuition, I regret to say, were as diverse and incompatible one with the other as those of the civilian flying schools.

There is a spirit of reform and reorganisation abroad in the land. We all recognise nowadays that our material is excellent, if we but knew how to utilise it to the best advantage. The civilian schools, despite all naval and military competition, have survived hitherto. It is an open secret that the official has regarded them of late with no kindly eye and has thought of their suppression. And not wholly without reason. Nevertheless, in the interests of the country—for the purposes of war and post-war times—the civilian schools must survive. They were the main reservoir from which our flying services were recruited; and so, when the bruit and clamour have subsided, will it be again.

The civilian schools have lately been in danger of extinction by official fiat or pressure. Not long ago, realising the dangers of this suppression, the Royal Aero Club took the matter in hand, and resolved to place the whole supervision, control, and methods of tuition at all civilian schools under its own ægis. The Club has now issued a set of regulations for the control of civilian flying schools, regulations

which we can fully endorse in every provision, and to which we believe the several schools will heartily subject themselves.

These are the regulations:—

1. Every instructor shall have obtained an F.A.I. aviator's certificate, and shall have been fifteen hours in the air in control of a machine after obtaining his certificate.

2. The maximum number of pupils for each machine in flying condition shall be six.

3. The maximum number of pupils for each instructor shall be eight.

4. The minimum proportion of reserve machines to replace those undergoing repair shall be one for every three in use.

5. The minimum time a pupil shall be in the air in the aggregate before making the necessary flights for an aviator's certificate shall be five hours, of which at least two hours shall be solo.

6. All schools shall keep a register of pupils under instruction, and a book giving full particulars of all flights made by them, which shall be open to inspection at any time without notice by officials of the Royal Aero Club appointed for that purpose.

7. The flying ground shall be kept clear while a pupil is carrying out the tests for an aviator's certificate; and each school shall undertake not to allow any of its pupils to fly while a pupil of another school is carrying out the tests for a certificate.

8. Particulars of all breakages and repairs to machines shall be kept in a book provided for that purpose, which shall be open to inspection by the officials of the Royal Aero Club.

9. The "Rules of the Air," as set out in the Competition Rules of the Royal Aero Club, shall be observed by all pupils.

10. Machines used for instructional purposes shall be inspected frequently by an instructor during the day's work, and always after a bad landing, and by a competent mechanic each day.

11. All machines shall be inspected at any time without notice by an independent inspector appointed by the Royal Aero Club.

12. Disputes between pupils and schools shall be submitted to arbitration by the Royal Aero Club.

There is not one of these regulations which is not patently justified; there is not one to which the directors or instructors of a school could reasonably object. They will set the house of the civilian school, which has often been reviled, in much-needed order, and will bring about some degree of unification. More, there is some reason to believe that the authorities that be view these new regulations with approval, and that approved schools complying therewith will receive their quota, as pupils, of officers from the lengthy waiting list. Under the new scheme, to which we

earnestly invite all civilian schools to subscribe, training would be limited to the preliminary stages of the art of piloting; for the second stage specialised naval and military schools are available.

One word more. It was high time that the system of tuition at civilian schools should be settled and unified; the more so since it is probably far cheaper and quicker than that obtaining at many a naval and military training centre—for it is not only at a civilian school that one has known of a score of pupils and more attached to a single "dud" machine. Is it not time that the Service schools should follow this excellent example?

Aircraft in the Naval Battle

No new or unexpected part was played by aircraft in the great naval engagement off Jutland on May 31. Aircraft were employed on both sides, seaplanes on ours, together with a mother-ship, which subsequent to the action rendered good service of another kind, and Zeppelins on that of the Huns. The purely naval part of the business lies not within our province, though it may be said without fear or hesitation—these words are written some time before they will appear in print—that we have good reason to be satisfied with the issue. In spite of the statements obtained from interviews with retired admirals some days after the fighting, it is perfectly clear that German aircraft played quite a minor part in the issue of the operations. The large rigid airship's scouting qualifications are undoubted and constitute a great advantage to the German fleet. But that advantage is not preponderating, much less decisive. As on land, despite all aerial activity, the issue is in the long run determined simply by infantry effectives (supposing other things to be approximately equal), so on the sea the battle fleet is the one deciding factor. Its operations may be assisted by extraneous means, such as superior aerial scouting and observation, but can never be decisively influenced. And, if properly organised and conducted, aerial observation by seaplanes or aeroplanes is, in the tactical sense as apart from the strategical, fully as effective and rather more rapid—except in one respect which will be dealt with now—as that by the slower dirigible.

The Zeppelins' rôle in the actual action was negligible from the reconnaissance point of view. The truth of this statement may be accurately measured by the fact that, had it been effectual, Beatty's battle-cruiser squadron, whose appearance upon the scene so far from its bases cannot have been fortuitous, any more than the subsequent emergence of the Grand Fleet, would have been too late. Suffice it to say, that there are more methods of observation than those that meet the eye.

Yet, the Germans, by virtue of their rigid airships, had the advantage over us, and in this respect: Suppose our seaplanes participated in the contest, as we are bound to assume, their range of wireless is restricted, as their radius of operations is restricted and bound down to a mobile base short of courting total loss. Moreover, their wireless is easily blocked, being feeble and of short range. On the other hand, the Zeppelin carries a wireless installation of considerable power and range: its comparative immobility and qualities as a steady platform, its ability to pass without any great interference through fog and rain, render it a splendid gunnery director.

Knowing nothing but what has been published of the Jutland battle, I make bold to say that the German Fleet scored in the generally misty weather that prevailed, as undoubtedly it did score during the preliminary stages, by the greater accuracy of its ranging as controlled by aerial observation from above, whereas our own range-finders were compelled to do their best handicapped as they were by curtains of mist.

It should not be forgotten that in modern naval operations a Zeppelin fleet serves a dual purpose. Offensive capacity it has none; but its scouting capabilities are undoubted, while its artillery spotting should prove eminently valuable, especially in misty weather, when it offers but a

hazy and indifferent target. Even so, these considerations need not disturb our equanimity, for in clear weather we shall always have the measure of the Hun at sea, and surely with the science at our disposal it should not be impossible to jam his airship wireless.

Gilbert and His Predecessors

It is certain now that Eugène Gilbert* has succeeded in escaping at the third attempt from his internment in Switzerland, where he had been compelled to land after his raid on Friedrichshafen, and reaching France and liberty again. The manner of his escape matters not: it is known, but cannot for the moment be revealed. The interesting point is that Gilbert is only the last of a long line of pilots who have succeeded in making their escape from imprisonment in hostile or neutral territory. We have our own case of the late Capt. Mapplebeck, who escaped after hiding in Lille for nearly three weeks, through the splendid efforts of M. Jacquet, who later suffered the death penalty for his self-sacrifice, and many another on whom it were as well not to dwell. The aviator's temperament and the faculty of initiative which marks him out pre-eminently may be responsible for the fact that the majority of escapes previous to that of Gilbert have been accomplished by aviators. A list of these adventures has recently been compiled by the *Matin*.

The case of Madon, interned in Switzerland, who succeeded in escaping across the lake of Geneva to the French shore, has already been related in AERONAUTICS. Most of the other aviator prisoners effected their escape from German custody. Just before the battle of the Marne, Fréville, a simple soldier pilot, lost his way, alighted behind the German advanced lines, and was made prisoner. Eleven days later he eluded the vigilance of his guards, and was hidden in a hospitable farmhouse, where he remained until the French recaptured the village. Corporal de Pracomtal, having lost his way in a fog, was captured by the Huns on November 20, 1914, wounded in the thigh. Interned in Wurtemberg, he tried to escape in April, 1915, but was tracked by police-dogs and recaptured, and condemned to 28 days' close imprisonment in a dark cell, without a mattress or blanket, and fed on dry bread and water. Subsequently he was removed to the fortress of Hohenasperg, whence he escaped with three fellow-prisoners on December 27, 1915. One of his companions broke his leg in dropping into the moat and had to be abandoned, but the remaining three succeeded in crossing the Swiss frontier, after travelling 140 miles in eight days, after 13 months' captivity.

Another pilot, Guidner, was more fortunate. On November 30, 1915, he attacked an L.V.G. and downed it, but, being in turn attacked by Immelmann and Bockle, was forced to alight in enemy territory. After setting fire to his machine he surrendered. A first attempt to escape from Lille failed, but a few days later Guidner, his observer, and an English pilot were conveyed to Germany by rail. When the train slowed down Guidner succeeded in dropping from a window and eluding pursuit. This was on December 7, and it was not until January 2 that he was able to rejoin his squadron. Capt. Ménard and Sub-Lieut. Pinsard (the latter of whom had already once before alighted in Hun territory, but in the nick of time restarted his motor and regained his own lines) also escaped from Germany after an adventurous voyage.

Many are the pilots who have been compelled to alight behind the German lines and yet have made their escape. Thus the cases of Lieuts. Bertin and Bozé. These two had set out on a continued reconnaissance flight; Bozé was compelled to alight and crashed, whereupon Bertin safely brought him back on his own machine. The same thing happened to Bobba (since killed), who rescued the Russian pilot Pulpe in similar circumstances. Similar adventures befel Lieut. Campagne and Capt. Voisin in August, 1914, and Lieuts. Didier and Martini, the latter of whom regained their own lines, after having destroyed their machine, by a forced march of thirty hours, during which they covered over sixty miles.

J. H. L.

GERMAN AIRCRAFT LOSSES ON THE WESTERN FRONT, MAY, 1916

BROUGHT DOWN BY BRITISH

- May 1—Two hostile machines were driven down in a damaged condition, and were seen to land a short distance behind the German lines.
- „ 4—We drove down two enemy machines behind the German lines. One machine was wrecked. . . . The other machine was damaged.
- „ 16—An Albatros was attacked, driven down, and wrecked near Lille. Another was driven down north of Vitry in a damaged condition. A third, attacked by one of our scouts, was seen to turn upside down near the ground.
- „ 17—One hostile machine is believed to have been accounted for, as it was last seen descending vertically.
- „ 18—One hostile machine was driven down behind the German lines.
- „ 19—Two hostile machines were brought down behind the enemy lines.
- „ 20—One seaplane was brought down by a naval

May 8—Two German aeroplanes were brought down in an air fight in the Verdun district. One of them fell in the vicinity of Ornes, and the other, which had been seriously hit, was compelled to come to earth south of Azannes.

- „ 16—One of our pilots brought down a German machine to the north of Vic-sur-Aisne, the two wings of the machine fell off during its fall.
- „ 17—One of our pilots, in an aerial fight, brought down a German aeroplane, which fell to the north-west of Rezonville. Another enemy aeroplane, riddled by machine-gun fire, fell in the region of the Ban de Sapt. In the region of Verdun three German aeroplanes were brought down.
- „ 18—A German aeroplane was brought down by one of our pilots near St. Ménéhould. The enemy aviators were captured. Sub-Lieut. Navarre brought down his tenth German aeroplane; the enemy machine fell and was smashed to pieces near Bolante, in the Argonne.



A PORTION OF THE OLD WORKS AT THE WHITEHEAD AIRCRAFT WORKS

patrol off the Belgian coast. (The seaplane here mentioned was returning from a raid on Kent.)

- May 20—An Aviatik fell on fire into some trees near Dinifer Wood, in the enemy's lines. Another hostile machine fell in flames near Concalmaison, also in the enemy's lines. A third crashed to earth in our lines near Maricourt. Early this morning a hostile machine landed undamaged in our lines. The pilot and observer are prisoners.
- „ 21—A hostile machine landed undamaged in our lines. The pilot and observer are prisoners.
- „ 22—One enemy aeroplane was driven down inside the enemy's lines in a damaged condition.
- „ 29—A hostile machine was forced down out of control within its own lines.
- „ 31—One enemy machine was driven down.

BROUGHT DOWN BY FRENCH

- May 1—A German aeroplane was brought down by one of our pilots. . . . The machine fell in the enemy's lines to the north of Douaumont.
- „ 4—One of our machines fought two German machines in the region of Douaumont. One of the latter fell in a wrecked condition. . . .

May 19—Sub-Lieut. Navarre brought down his eleventh German aeroplane. The machine fell in our lines at Chattancourt; the enemy aviators were captured. Another German aeroplane, attacked by Sub-Lieut. Jesser, fell and was dashed to pieces in the Forges Wood. Three other German aeroplanes which were fired upon by our machines with quick-firing guns were seen to fall vertically nose down in their own lines.

- „ 20—One of our motor guns brought down a German aeroplane in the region of Verdun.
- „ 20—During an aerial combat between four of our machines and three Fokkers over the Forest of Bezanges one of the enemy aeroplanes was brought down. Another Fokker, attacked by one of our pilots, was forced to come down in his own lines under the fire of our batteries, which destroyed the machine.
- „ 21—Allied aeroplanes despatched in pursuit of the enemy machines succeeded in bringing down two of them just as they were recrossing their lines. (This refers to the bombardment of Dunkirk on May 21.)
- „ 21—In the course of an aerial fight one of our pilots brought down a German aeroplane in the region of Les Eparges. Two other enemy machines were wrecked—

one in the enemy's lines near Liancourt-Fosse, near Roye, the other in our lines, at Fontenoy, west of Soissons.

May 22—One of our chaser aeroplanes, sent in pursuit of one of the German machines which had just bombarded Dunkirk, encountered and brought it down at Wizzlele, north-east of Cassel. In Alsace two enemy aeroplanes were forced down in an aerial fight. One fell in our lines at Senthiam (south of Thann), the other in the region of Bonhomme, close to our trenches.

„ 23—In the region of Furnes a German machine, shelled by one of ours, was brought down in our lines. Near Beaumont an Aviatik, which was badly hit in the course of a fight, fell in the enemy lines. In the region of Linge one of our pilots, attacked by three enemy aeroplanes, brought down one of his adversaries.

„ 25—In the course of a fight in the air one of our pilots brought down a Fokker, which fell in the enemy lines to the north of Vaux. In the region of Etain one of our air squadrons engaged a group of German machines, two of which were badly hit and compelled to land.

„ 28—Our pilots were engaged in fifteen aerial fights with German aeroplanes. Two of the latter were brought down. One fell in flames near Monthois (Argonne) and the other in the region of Amifontaine (north of Berry-au-Bac). During a range-finding flight one of our pilots was attacked to the north of the Aisne by a Fokker, which fired over a thousand shots at him. The pilot succeeded in getting back to our lines pursued by his assailant. The latter was then attacked at a range of thirty yards by a French machine, and was brought down near Bourgogne, to the west of Rheims. On the left bank of the Meuse our motor anti-aircraft guns brought down two German machines, which fell, the first to the north of Avocourt and the second near Forges.

GERMAN CLAIMS

BRITISH MACHINES BROUGHT DOWN

May 5—An English biplane, with a French distinguishing mark, fell into our hands undamaged on the coast in the neighbourhood of the Dutch front. Its occupants saved themselves in neutral territory.

„ 5—A hostile aeroplane was brought down in an air fight off the coast of Flanders, one of our torpedo-boats assisting. The approach of British forces prevented the rescue of the occupants.

„ 6—To the south of Warneton Sergt. Frankl brought down a fourth English biplane.

„ 6—One of our torpedo-boats captured a British aeroplane off the coast of Flanders undamaged, the occupants, both officers, being also captured.

„ 11—A British aeroplane was brought down by our anti-aircraft fire south-east of Armentières.

„ 17—Lieut. Immelmann shot down his fifteenth aeroplane west of Douai. An English aeroplane was brought down in an air fight near Fournes. The occupants, two British officers, both wounded, were taken prisoners.

„ 20—Near Ostend an enemy aeroplane was shot down by our anti-aircraft guns, and fell into the sea.

„ 29—One English biplane crashed to earth after an aerial battle near St. Eloi, and was destroyed by our artillery fire.

„ 31—West of Cambrai a British biplane was shot down in an air fight. The occupants (officers) were wounded and captured.

FRENCH MACHINES BROUGHT DOWN

May 1—In an air fight a French biplane was shot down east of Noyon. The occupants were dead.

First Lieut. Boelke shot down his fifteenth aeroplane over Poivre Hill, and First Lieut. Baron von Althaus his fifth enemy aeroplane north of Fort St. Michel.

„ 3—First Lieut. Baron von Althaus shot down his sixth enemy aeroplane over the Caillette Wood. A French

aeroplane was brought down in an air fight south of the Thiaumont Redoubt. Two other machines were brought down by our anti-aircraft guns—one south of the Talou Ridge and the other near the Thiaumont Farm. A fifth machine was brought down by our machine-gun fire near Hardoumont. The pilot of this last machine was killed and the observer severely wounded.

May 4—One of several enemy aeroplanes . . . was shot down after an aerial battle near Middlekerke. Its occupant, a French officer, was killed. To the west of Lievin two enemy aeroplanes were brought down by the fire of our anti-aircraft guns and machine guns. In the neighbourhood of Vaux Fort two French biplanes were put out of action by our aviators.

„ 6—To the south-east of Diedenhofen (Thionville) a French machine was forced to land, and its occupants were taken prisoners.

„ 8—Two French biplanes fell to the ground in a burning condition over the Froidterre Hill (east of the Meuse).

„ 13—A German battle aviator shot down an enemy biplane over the Bourguignon Wood, south-west of Laon.

„ 18—Lieut. Boelke brought down his sixteenth enemy aeroplane south of Ripont (north-west of Tahure, in Champagne).

„ 19—Five enemy aeroplanes were shot down, one by infantry fire south-east of Vailly, and four in air fights near Auberville.

„ 20—Four other machines were brought down in the course of aerial fighting, two of them within our lines near Lorgies, north of La Bassée and south of Château Salins, and the others behind the enemy's front at the Bourrue Wood, west of the Meuse and east of Verdun.

„ 21—An enemy biplane after a fight fell into the sea.

„ 21—Four more aeroplanes were placed *hors de combat* within our lines—namely, near Wervicq, near Noyon, near Maucourt (east of the Meuse), and north-east of Château Salins. First Lieut. Boelke shot down his seventeenth and eighteenth enemy machines south of Avocourt and south of the Mort Homme.

„ 22—An enemy aeroplane was shot down south-west of Vailly.

„ 25—Two enemy biplanes were shot down in air fights, one near St. Souplet (in Champagne) and the other near Herbebois (north of Verdun).

THE MONTHLY SUMMARY FOR MAY

IN accordance with our usual practice, we publish a detailed list, extracted from the daily official communiqués, of aeroplane losses along the Western Front. It should once again be observed that it is impossible to establish the correct figures with absolute certainty, especially in the case of the German claims, which are in many cases, and no doubt purposely, extremely vague. On the whole, however, the following summary, which has been very carefully compiled, may be said to reflect with fair accuracy the general trend of the war in the air, as measured in terms of aeroplane losses due to hostile agency.

GERMAN LOSSES

Brought Down by British :					
In own lines	In enemy lines	Uncertain		Total	
12	4	4	...	20	
Brought Down by French :					
19	11	9	...	39	
BRITISH LOSSES					
9*	1	1	...	11	
FRENCH LOSSES.					
13	15	9	...	37	
This gives a total of 48 Allied machines brought down					

* Including three seaplanes.

NIGHT FLYING—ANCIENT AND MODERN

By MAHGNI-ELTTEN

ANCIENT

FOR the purpose of this article considerations will be confined to machines sustained in the air by dynamic flight, and we may as well state at the beginning, as a warning, that night flying is no relation, however distant, to moonlight flitting, although the moon has on occasion condescended to shed a little light on our efforts, if somewhat flit—sorry, I mean fitfully.

The first instance of night flying is Grahame-White's classic ascent at 2.30 a.m. at Roade, on April 28, 1910, during his second attempt in the London-Manchester race. For nerve and dexterity this will ever remain one of the wonderful feats achieved on those early frail machines by their adventurous pilots.

Imagine a small grazing field of uncertain contour, bounded by trees on three sides and a hedge and telegraph wires on the fourth, wind in fitful gusts such as only April knows, and a tantalising moon playing hide and seek amongst the low-lying clouds, and you have the *mise-en-scène* of the first night flying in the world's history of aviation. It should also be remembered that machines in those days rolled an average of 50 to 60 yards before rising (although at the Wolverhampton meeting a few weeks later I saw G. Cockburn's "Father of all Farmans" rise in something like 11 yards).

The next night flying I witnessed was at Hendon in the autumn of 1912. This was the first organised night flying in England, and, I believe, in the world. In this instance also Grahame-White made the first three ascents, and Louis Noel followed. The experiment was not an unqualified success, although marked by complete immunity from harm as regards machines and personnel; the atmosphere was thick with a heavy mist; the lighting arrangements were carried out by two powerful automobile searchlights (belt driven off a car) and one powerful marine searchlight electrically driven from the atelier and mounted on the old judge's observation box. The machines at no time rose to a height of more than a few hundred feet, and great difficulty was experienced in keeping the rays focussed on the machine (such being the purpose), and once the aeroplane was lost it was extremely difficult to pick it up again. The pilots were naturally blinded when coming into the glare of the light. This method of way-finding was not further tried. In addition, the machines were studded with electric bulbs (worked off the engine magneto) of red, white, and blue, independently or collectively controlled, the main idea at the back of the promoter's mind being to give an exhibition, illuminated, of night flying in conjunction with a pyrotechnic display. Sundry other night flying exhibitions took place at intervals from then onwards.

MODERN

This portion will not be reminiscent, like the foregoing, but will be devoted chiefly to what a pilot may expect to see from above at night and how to obtain the best results. The whole of it will be written from a military standpoint and with special regard to conditions obtaining on the front at this moment.

The conditions of night flying in England and in France are vastly different: in many instances pilots fresh from England have had no previous experience in it, whilst others who have flown a lot are not up to the same flying standard as those who are initiated out there, and anyway they all require a lot of practice from a military viewpoint.

Individual opinions often differ as to the merits of particular machines, and it is not often that one gets such a unanimity of view as is expressed in favour of a certain type in regard to its nocturnal qualities. It makes an excellent night flier and—more important—night lander; pilots with very little or sometimes no experience in this art of flying invariably make good landings on these machines. Naturally, pilots with insufficient experience are not per-

mitted to take up observers to fill the passenger's seat, and consequently ballast is required to give the machine longitudinal stability. This type, being perhaps the most successfully designed of the R.A.F. productions, is extremely tail heavy without its full complement, and even with 100 lb. is still slightly so; pilots will find that 135 lb. weight will give the best results and will eradicate any jerky tendency should the engine suffer from "variable pull"—in fact, the machine has been safely flown "hands off."

Whilst on the subject of landing, it is interesting to note that the French have an excellent landing system, very similar to our own, and it has been extensively used during the recent and present Verdun operations. Barring unfortunate contingencies, French machines are not permitted to land until they get the signal "All clear" from below. When a French pilot arrives over what he thinks is his own aerodrome, he circles round, sending his own special letter in morse by searchlight; this should be answered by one of the ground projectors, and a machine should never land until the call has been answered, the main idea being to prevent machines landing on hostile aerodromes or even on those of neighbouring squadrons.

The method in use in British squadrons is that a pilot on approaching an aerodrome, and wishing to descend, will fire one of his Very lights. The signal—predetermined—will be answered from the ground. If the signals agree, the pilot will know he is over his own drome and may accordingly land. If the signals do not agree, he will recognise from the colour of the ground signal the aerodrome he is over. As every pilot should memorise the signals of adjacent aerodromes, this method will also assist him in determining his course for his own. The distribution of landing flares is on the following system:

Three flares in line, so:	0	0	0
	1	2	3
One flare in the R.H.			0
bottom corner, so:			4

And a pilot wishing to descend should know by pre-

arrangement which of these flares are doubled so: 0. And different one in each brigade. The various aerodromes and landing stations in a brigade are distinguished by the colour of the Very lights fired from a spot adjacent to the double flare. Owing to military exigency, it is impossible to state plainer the code on which this is based.

Flare lighting is controlled by the Brigade Headquarters. They are lighted on receipt of orders, and are kept going until ordered out. At its discretion a Brigade Headquarters may request a neighbouring aerodrome to "flare up." Pilots flying at night are individually responsible for informing their Brigade Headquarters of their safe atterisage.

Night flying is dependent largely upon the weather, but for our purpose can be divided into two categories—moonlight nights and otherwise. When conditions are good, and the moon bright, perfect night flying can be practised and observations taken easily up to a height of 9,000 ft.; landing grounds and aerodromes can be seen quite plainly at this height, although on ascent the machine is quickly lost to view from below. So difficult is it to spot machines at night, unless carrying distinguishing lights, that a hostile machine over our lines on one occasion could neither be seen from the ground nor the air. On occasions when our machines penetrate over the Hun lines the enemy guns cease firing, presumably so that gun flashes shall not be spotted. Under the most perfect conditions railways are difficult to see, but sometimes a train may be recognised by its white smoke.

With no moon, at 5,000 ft., it is not possible to distinguish railways, roads, or rivers; but aerodrome flares are quite effective at this height—in short, on moonless nights only lights can be seen. Even on "moony" nights at

2,000 ft. unlighted objects cannot be seen with any certainty on the road; yet at 7,000 ft. on an ideal night roads are clearly seen looking vertically down, and lighted motor transports are easily discernible. Villages and towns are also "on view"; trenches may also be seen with the aid of flares.

The danger of keeping aerodromes flared whilst machines are out on reconnaissance results sometimes in hostile machines (which cannot be placed) dropping bombs.

We have by no means reached finality in the design either of parachute flares or wing-tip flares. Of two parachutes tried recently, only one burnt, whilst with the other flare, on examination, it was found to be only partially burnt; the flare ignited, burnt steadily for a short time, and then went out, with half the composition unburnt. This is extremely dangerous, as it leaves the pilot blinded just at the moment of landing, when he most needs it. The arm of the flare is apparently too weak, and gets bent in the course of flying. If bent so as to bring the flare close to the wing, it should work satisfactorily.

Harking back to the landing difficulty, the suggestion that every aerodrome should be equipped with a portable pro-

jector is excellent. Provided the pilot is always able to land head on to wind, the beam remains pointed to windward. Great care must be taken to keep the beam stationary, as any glare in a pilot's eyes would blind him and have unfortunate results.

A closing hint to flight and squadron commanders might not be out of place here.

Pilots detailed for night flying should have plenty of opportunity to practice on the same machines with which they will fly at night, and should be instructed to practice the following operations:—

1. Flying by instruments alone—*i.e.*, without using the horizon as a guide.
2. Gliding slowly.
3. Making small sideslips and quick recoveries.
4. Checking the speed of the machine and identifying it with the sound of the wires under certain conditions.
5. Turning—using instruments alone.
6. Landing slowly.

THE SIZE OF ZEPPELINS

A BEWILDERED public—or, at all events, that portion thereof which seeks to take an intelligent interest in the development of aerial navigation during the course of the war—has learned to place no faith in the reports of "our own correspondents," "our special correspondents," and others who send long and laborious cables from the various theatres of war, or preferably from neutral countries, and profess to give information (save the mark!) regarding the enemy's aerial progress. Even where accurate details should be obtainable with a minimum of trouble by the man on the spot, or, at any rate, from the authorities immediately concerned, such information remains apparently inaccessible, unless newspaper correspondents prefer to evolve it out of their own inner consciousness. Such was the case with LZ77, brought down by the French at Révigny, whose structural features and principal dimensions are, of course, perfectly well known to the authorities, and which, as a matter of fact, were distinctly interesting from a technical point of view. Such, again, is the case with regard to LZ85, brought down off Salonika, which appears to have measured 170 metres, or 567 ft., in length, which is practically the key dimension.

There is a general impression, and it has even been definitely stated, that the Germans are confining their energies to the construction of large rigid. One writer even goes so far as to say: "It is almost certain that the Germans are not taking the trouble to build even moderately small Zeppelins, but are—and very sensibly too—making them as large as they can with reasonable facility." This statement is not only incorrect, but reveals a thorough misconception of the rôle assigned by the Germans to the Zeppelins as based on their experience gained during the war. The opening months of hostilities showed the futility of employing Zeppelins for land operations by day; their subsequent utilisation by night revealed the further defect, which had long been recognised, that except under the most favourable weather conditions, the size and fragility of these comparatively large craft rendered their safe landing a matter of extreme difficulty. Losses from this source are known to have been considerable. But this consideration did not apply to naval warfare (either in scouting or in long-distance raiding), or only in a minor degree; hence the Germans—"and very sensibly too"—increased the size and power of their naval craft with each successive design.

But the Hun is a pertinacious animal; once convinced of the supreme utility of Zeppelin operations by land as well as by sea, he set himself to evolve a new design for land warfare, with the result that he produced a small rigid craft

of great speed, but possessing restricted carrying and climbing powers. The purpose of these craft was to raid our communications by night; and the vessel brought down by the French on the eve of the Verdun battle—which, be it observed, was flying at a low altitude as such matters go nowadays—appears to have belonged to this type.

If we are to initiate a rigid airship programme—a point regarding which nothing is known, or, if known, could not be mentioned—it would be well to bear in mind points such as these and to remember the various possible applications of the rigid dirigible. One has, of course, to consider the respective potentialities for inflicting damage by bombing—dropping possessed by an airship and a fleet of, say, a dozen aeroplanes, assuming the weight of explosives to be the same in each case; in point of invulnerability the aeroplane squadron undoubtedly scores, but by night the raiding dirigible has its own distinct advantages. At all events, it would be well not to model possible constructional endeavours too closely on such Zeppelin craft as have come under our more immediate notice.

J. H. L.

THE DESIGN OF AERO-ENGINES

To the Editor of AERONAUTICS

SIR,—With reference to a letter signed by "H. Walker, Birmingham," appearing in AERONAUTICS, May 31, page 350, I would be obliged if you would kindly point out that my article, entitled "Some Notes on the Design of Aero-Engines," was written during the latter part of March, 1915, and that the engine referred to by me as being fitted with auxiliary connecting-rods is *not* the engine which is now generally referred to as the R.A.F. The engine referred to by me was designed at the R.A.F., though whether it was ever built I do not know, but I sincerely hope that it was not. *This engine did*, in the drawings, contain auxiliary connecting-rods. My gratitude is due to Mr. Walker for his timely information.

In reply to the letter signed by "F. T. Mahgni-Eltten, R.F.C., B.E.F.," I must admit that it requires a large stretch of imagination to conjure up an adequate mental picture of concentrated aeroplane traffic equal in magnitude to the normal motor traffic on the Portsmouth road; but if aviation does after the war continue to progress at its present rate, then such a state of affairs as portrayed in my article will not be long in coming about. The prospect may be rather alarming, but it is not so impossible as may appear at first sight.—Yours faithfully,

June 1, 1916.

JOHN WALLACE.

RECENT IMPROVEMENTS IN MACHINERY AND CONSTRUCTION

ALUMINIUM WELDING EXTRAORDINARY

IN his address the other day at the London University, Lord Rosebery, as Chancellor, after speaking of the general impoverishment that will inevitably follow the War, referred, with feelings of pride, to the millions of British men who will return from the far-flung battlefields with a new spirit and a new view of the world. From men, said Lord Rosebery, they will become super-men. Had he cared to pursue the theme his lordship might have gone on to refer to the new forces that have energised British business men in a way that has no parallel in history. A whole volume might be written of the great British engineering works alone.

This great evolution gives every man his chance. To-day it is next to impossible to replace at any cost the engineering plants up and down the country. The duplicates simply do not exist, and the heavily driven makers have neither the time, the material, nor the men to make them.

for their specialists to go up to the Tyneside and weld the two aluminium vessels in the firm's own works at Newcastle. The repair was an entire success, and, said the owners, the cost of the repairs to the two pans by Barimar was exactly the same as the cost of the repairs to one pan in London by the other firm. Thus, the Barimar service saved the firm not only £400, but half the cost of the repairs, to say nothing of the amount saved by the absence of shipping delays and freight charges.

The illustration shows one of the vessels removed from its seating.

Interviewed on the subject, Mr. C. W. Brett, the managing director and general manager of Messrs. Barimar, Ltd., said that to highly skilled Barimar experts the work presented no special difficulty, and sure of the results of their process, Barimar readily gave their usual guarantees as to perfect treatment. Any damaged part in any metal or alloy,



LARGE ALUMINIUM PAN REPAIRED BY BARIMAR, LTD.

Machinery suffers from wear and tear, and is liable to fracture. When that happens the owner finds only two courses open. He has either to close down or have repaired what he cannot replace.

Recently the owners of large works on the Tyneside had disabled two valuable aluminium pans, weighing a ton, and costing nearly £400, but, unfortunately, owing to the War, these could not be replaced. Although the firm keeps its own welders, they are not specially trained for the handling of aluminium, and they were at a loss to know how to get out of their dilemma. On an earlier occasion they had sent a fractured vessel of the same kind 400 miles by sea to a firm in London, incurring heavy expense, to say nothing of the loss resulting from the inevitable delays in transshipment in war-time; and the experiment of having one pan treated by a local firm was not a success. Wishing to avoid a repetition of the trouble, the owners sent to Messrs. Barimar, Ltd., 10, Poland Street, Oxford Street, London, W.,

from smashed crank cases, gear boxes, or cracked cylinders, to the most intricate machinery, is admirably dealt with, and to-day Barimar is extensively engaged on much Government work and many orders from munition and municipal undertakings.

SHEET METAL WORKING MACHINERY

MESSRS. J. Rhodes and Sons, Ltd., are among the oldest and largest manufacturers of sheet-metal working machinery, and are prepared to guarantee that their machines are the most modern on the market. They supply all the leading electrical, mechanical, and shipbuilding engineers with presses and shears, etc., and also make a great speciality of tin-box machinery of every description.

Among the machines principally supplied by this old-established firm to aeroplane works are:—

Power presses for making various sheet-metal stampings

by means of dies or cutting-out tools. Where only a small number of articles are required, and the demand would not in consequence warrant tools for cutting out the complete blank, there is on hand a special "nibbling"



8 FT. GUILLOTINE SHEARS FOR CUTTING
 $\frac{1}{4}$ IN. PLATE

press, with simple tools for rapidly "nibbling," or following round the blank at a number of cuts. This method, although somewhat slow compared with the press and



48 IN. ROTARY SLITTING SHEARS (MOTOR DRIVEN)
FOR CUTTING $\frac{1}{4}$ IN. THICK MILD STEEL

blanking die, is a great improvement on the old hand method of chipping and filing to shape.

Further, the firm supplies power friction screw presses for making various stampings which have hitherto been produced in a drop stamp, a method which is now quite out of date, and very much more expensive than stamping by power screw presses.

Guillotine Shears—These are made in many sizes and strengths for cutting from the lightest sheets up to 1 in.



"NIBBLING" PRESS

thick and up to 16 ft. wide; but the machines mostly in demand for aeroplane factories are those to cut up to $\frac{1}{4}$ in. thick and up to 8 ft. wide.

Next, the firm also specialises in sheet-metal working plant of every description, and will be glad to quote for machinery for any duty.

ALEXANDER THREE OPERATION AUTOMATICS

Three operation automatic screw machines, or pin and stud machines as they are sometimes termed, are deservedly popular and widely used on account of simplicity of design and ease of operation. The type is fully automatic, as the operator has nothing to do but insert the bar in the feeding mechanism, remove the finished product and swarf from the pan of the machine, and keep the simple tools with which they are equipped in order. A successful operator can run with the aid of a boy as many as twenty of these machines on certain work, providing the pace is not set too high; many manufacturers prefer a moderate pace, with long life to the tools, and a larger number of machines per operator, as being more economical than high speeds, with the consequent repeated tool grindings, with the time lost in stopping, and the extra number of operators required. Thus, for instance, some manufacturers of bicycle chain will run as high as twenty finished chain rolls per minute, whilst others prefer a running speed of twelve. In any event, the speed at which a piece can be produced on this machine is entirely within the will of the manufacturer up to the maximum limit which is possible for drilling, forming, and cutting off. The machine itself is constructed sufficiently well so that the headstock can be driven at the maximum speed, and the rigidity of the machine, due to the proper proportion of its component parts, is such that it will stand any strain which can be put upon it.

Any piece within the capacity of the wire feed can be made on the machine which does not call for more than three operations, and work which needs more than three operations can oftentimes be done to advantage on this machine, as the secondary operations can be cheaply done elsewhere, such, for instance, as nuts and cones, which are blanked on this machine and automatically tapped on nut tapping machines; bolts, screws and studs, having threads which are blanked first and subsequently threaded in a screw threader or a bolt cutter. For plain or taper pins, balls, washers, rollers, and such-like pieces, the machine is perfectly adapted.

The spindle is of the best quality hammered steel. The bearings are substantial and lined with the best quality anti-friction metal. All slides, are of good width, and plenty of swarf clearance is allowed. The cross slide is in two pieces, and can be operated independently or simultaneously, a time-saving feature when forming and parting.

off can be done at the same time. It is fitted with fine adjustment for forming to exact diameter, with positive drawback on cams in all sizes above $\frac{1}{2}$ in. wire feed. The cam drum actuating the cross slides on all sizes excepting Model "D" is in two halves to facilitate fitting of cams. The machine is fitted with an efficient stop for feeding to dead length. Five changes of feed through gearing are regularly supplied to all models. All necessary working parts are hardened and ground. An efficient oil pump is fitted to each machine. Models "G" and "H" are fitted with geared headstock and differential feed motion.

The standard equipment comprises:—Countershaft, front and rear tool posts, standard size round collet and feed fingers, five sets change gears, hand feed handle, hand unlocking device, two oil splash guards, and spanners.

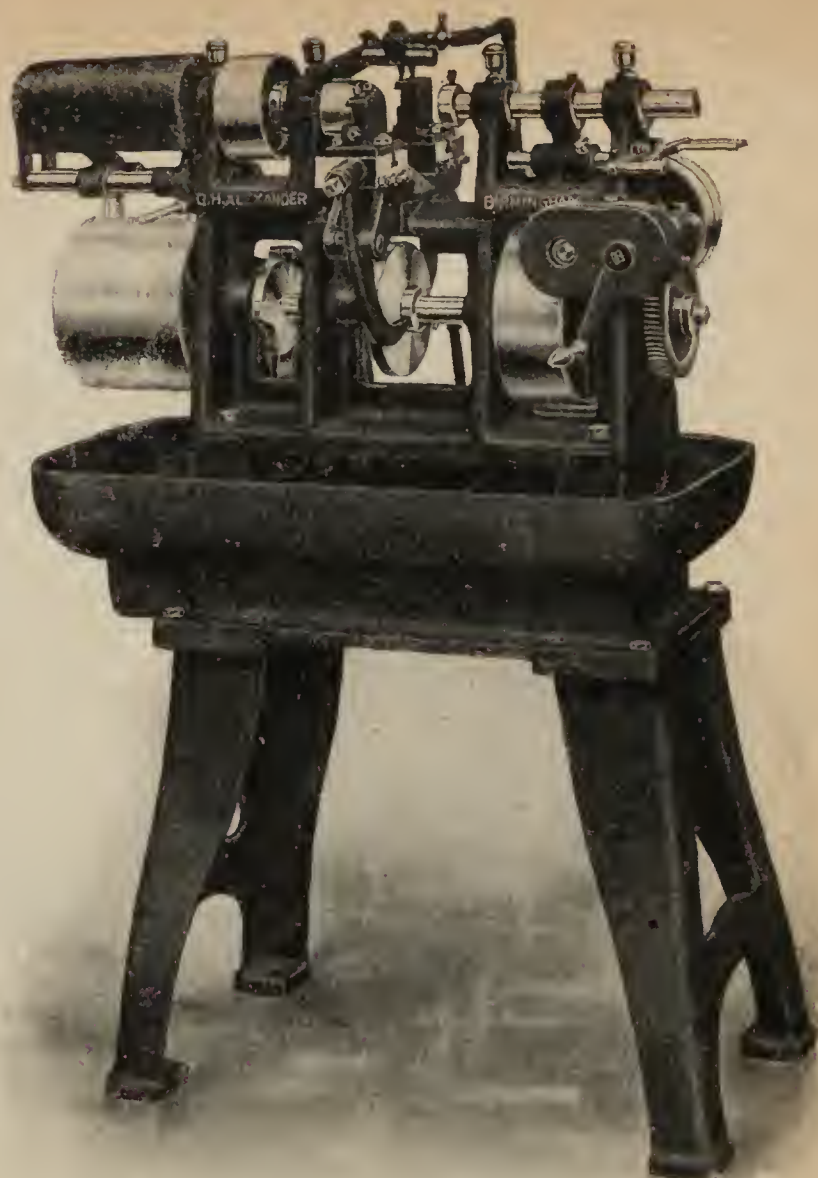
ROOFING FOR FACTORIES

The attached illustration is of Messrs. F. W. Berwick and Co.'s new factory at Park Royal, London, for the manufacture of aero engines. The factory comprises seven large bays, each 180 ft. long by 60 ft. span, and is a good example of a cantilever type of roof fixed to large span lattice girders.

The steelwork is by the Aston Construction Co., who specialise in this type of roofing. This company is to be commended for the way in which it has adapted itself for the rapid supply of large span roofs, giving big floor spaces uninterrupted by columns, which war conditions have called for, particularly in the aviation industry.

The Aston Construction Co. has achieved some remarkable results in the way of rapid erection. To manufacture and erect a roof 140 ft. by 140 ft. in twenty-six days, and to supply two sheds for France, each 300 ft. by 40 ft., in twenty-one days, is no mean achievement under the present difficult conditions of labour and material.

Evidently our American friends are not the only people who know how to hustle.



MODEL "D" $\frac{1}{2} \times 3\frac{1}{4}$ IN. CHUCK CAPACITY



MESSRS. F. W. BERWICK & CO.'S NEW FACTORY AT PARK ROYAL

MONOMETER TINNING FURNACE

NATURAL processes and those in the mechanical arts have a certain similarity in that both, by a series of infinitely small steps, arrive at apparent perfection.

In the mechanical arts, however, an inventive mind will sometimes bring into being a new or improved process or new means to attain an old end in a cheaper or more efficient manner, which will almost revolutionise an industry; and those concerned will wonder how it was that no one ever thought of it before. In this category may be placed the coating of wire with molten metal.

The method current in this trade is to draw the wire through an open pot containing the molten metal, the very considerable loss through surface oxidation being accepted as inevitable. Many ingenious features characterise the system just introduced by the Monometer Manufacturing Co., Ltd., Whitehouse Street, Aston, Birmingham, all of which are directed to decrease the cost and increase the efficiency of the process. One may say that the outstanding feature is an enormous saving in residue.

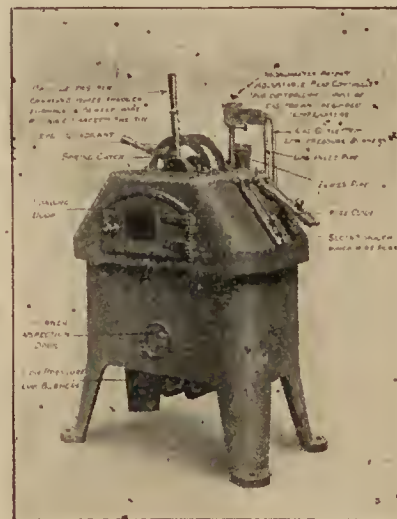
Briefly, the special features comprise a complete enclosure of the melting pot, means for the prevention of oxidation of the molten metal, a self-acting heat controller for maintaining the metal at the correct fluidity, a system of heating by low-pressure gas, which produces intense heat without fans, blowers, or compressors, and ensures perfectly uniform distribution of the flame and heat, special guiding devices for the wire, which enable it to be rapidly threaded on to the guide rollers, and the elimination of fumes. The last feature was the motif for a recommendation by His Majesty's Chief Inspector of Factories.

Dealing individually with the technical features outlined above, the general description of the furnace will certainly appeal to the industry to which this process is of interest. The body of the furnace is strongly constructed by casting, and supports the melting pot, which is covered by an enclosing dome-shaped casting, forming virtually a sealed chamber for the melting operation. This chamber is supplied with inert gases from the Bunsen burners under the melting pot, so as to produce an oxygen-free atmosphere; and the experience of many users of this system prove conclusively that the saving in residue effected amounts in many instances to not less than 4s. per ton of metal melted.

Another factor in reducing the dross formed is the automatic temperature-controlling device, which operates on the thermostatic principle, and is so constructed and arranged that immediately the metal has attained the required fluidity, the supply of the burners is cut down and the temperature of the molten metal kept constant. In wire coating this is a most important point, as if the metal is too fluid or is not sufficiently viscous, the coating on the wire or cable is imperfect, and leads to a great amount of waste.

The patent gas burner system comprises any desired number of Bunsen burners fitted to an equalising chamber,

which distributes uniformly the volume and pressure of gas supply to the individual burners, the latter themselves having a peculiar internal construction which produces an intense heat with a remarkably low consumption of gas. The gas supply is simply connected up to the ordinary town gas main, and there is no auxiliary mechanism, such as fans, blowers, or compressors, to increase the cost of the apparatus.



Within the melting chamber and above the melting pot are arranged a series of guide rollers over which the wire is run, the lowermost rollers being mounted on slidable rods individually adjustable, in order that the rollers may be moved to facilitate threading of the wire. A novel point is the spring control of the rollers when in the active position, which, substituting resilience for rigidity, almost eliminates the possibility of wire breakages. As the wire leaves the molten metal it encounters a fixed wiper, so positioned to direct the drips back into the melting pot, the final wiping device being outside the melting pot, and having the wiping blocks readily adjustable in regard to the pressure exerted on the wire.

Any required number of wires can be coated simultaneously, the wire simply being wound on a drum and thus passed through the melting pot.

The accompanying illustration shows the general arrangement of the furnace, though the external wipers (which have adjustable tension with a separate wiper for each wire) are not shown, being on the other side of the furnace.

Generally it may be said that the furnace is throughout most strongly constructed, with an ample reserve of metal, likely to meet any possible contingency that may arise, and the workmanship is such as is rarely found in furnace work.

This is not surprising, as the Monometer Manufacturing Co. have a splendid equipment of machine tools for turning out the highest class of work, and are prepared to supply the complete tinning plant as well as the furnace alone.

AEROLITE ALLOY PISTONS

Aerolite alloy, the result of over two and a-half years' experience with aluminium pistons, had a fine pre-war record in motor engineering. The D.F.P. car which secured and still holds all records of its class, was fitted with these pistons, and also the D.F.P. car which ran with such conspicuous results in the International Tourist Trophy race in June 1914. The results obtained with these cars were so successful that after the outbreak of war experiments were begun with pistons for aeroplane engines with results that have been entirely successful. The Aluminium Piston Co. are now making pistons from 60 mm. to 140 mm. diameter, and are not only prepared to undertake castings, but to prepare designs and make patterns.

Aerolite alloy has a strength equal to cast iron, the resulting piston shows a saving in weight from one-half to two-thirds, there is no tendency to warp as experienced with steel pistons, and the high heat conductivity of the metal overcomes any tendency to pre-ignition, and in many cases allows the compression of the engine to be raised, thus enabling it to develop more power. It has been said that, owing to the high expansion of

aluminium alloys, the working clearance that must be allowed is so excessive that the pistons tend to knock, but against this must be set the cooler working temperature of the piston, which, to a large extent, counteracts for the expansion, and if the pistons are carefully fitted in the first instance no trouble is likely to be experienced. Another point is that as the heads of the pistons keep cooler they are less likely to carbonise than cast iron pistons. This was extremely noticeable in past motor-car racing experience, where it was found that on examination of cast iron or steel pistons the oil had actually burnt on to the head, whereas, under similar conditions with aluminium pistons, the head was wet with unburnt oil. There is no tendency to wear either on the piston wall, the gudgeon pin boss, or ring grooves, as aerolite is a hard metal and wears as well as cast iron. This cannot be said of other aluminium alloy pistons, in which magnesium, zinc or tin enters into the composition.

The Aluminium Piston Co. are expert designers and will be pleased to assist manufacturers, modifying the design of their pistons to suit aerolite alloy, and provide patterns when required.

REPORT COVERING INVESTIGATIONS OF AVIATION WIRES AND CABLES, THEIR FASTENINGS AND TERMINAL CONNECTIONS*

By JOHN A. ROEBLING'S SONS CO.

(Continued from page 353)

PLATE No. 6

ROEBLING 7 BY 19, TINNED AVIATOR CORD

Figure No. 1 shows thimble spliced in 7 by 19 tinned aviator cord.

Figure No. 2 shows the splice after the serving is applied.

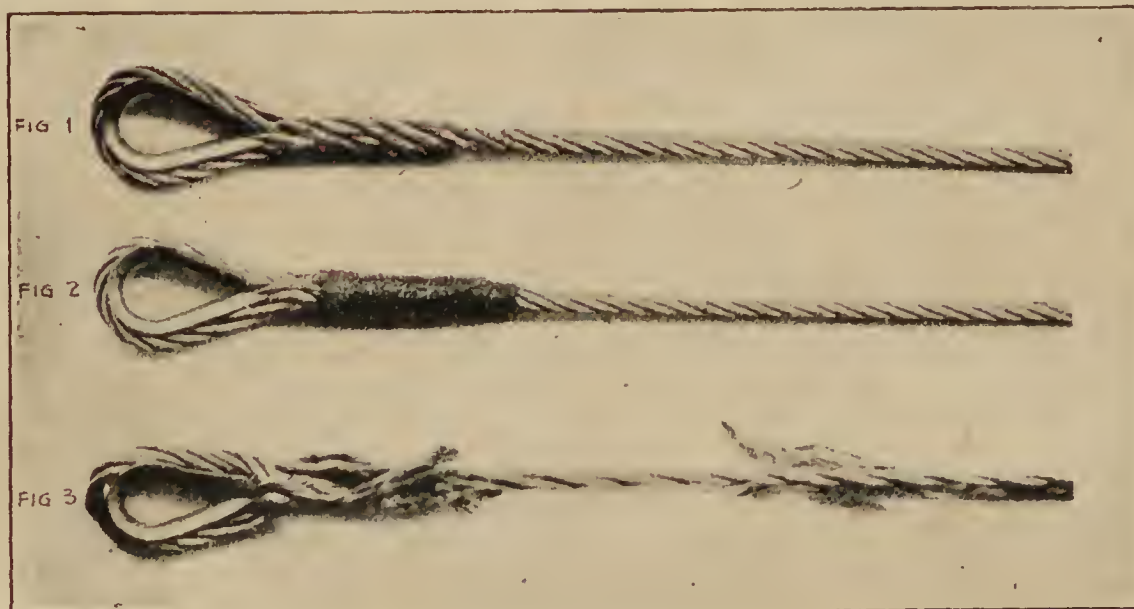


PLATE No. 6

PLATE No. 7

THIMBLES

The eye splice in strand and cord should be protected by means of either steel or brass thimble.

The brass thimble can be used for 19-wire strand for

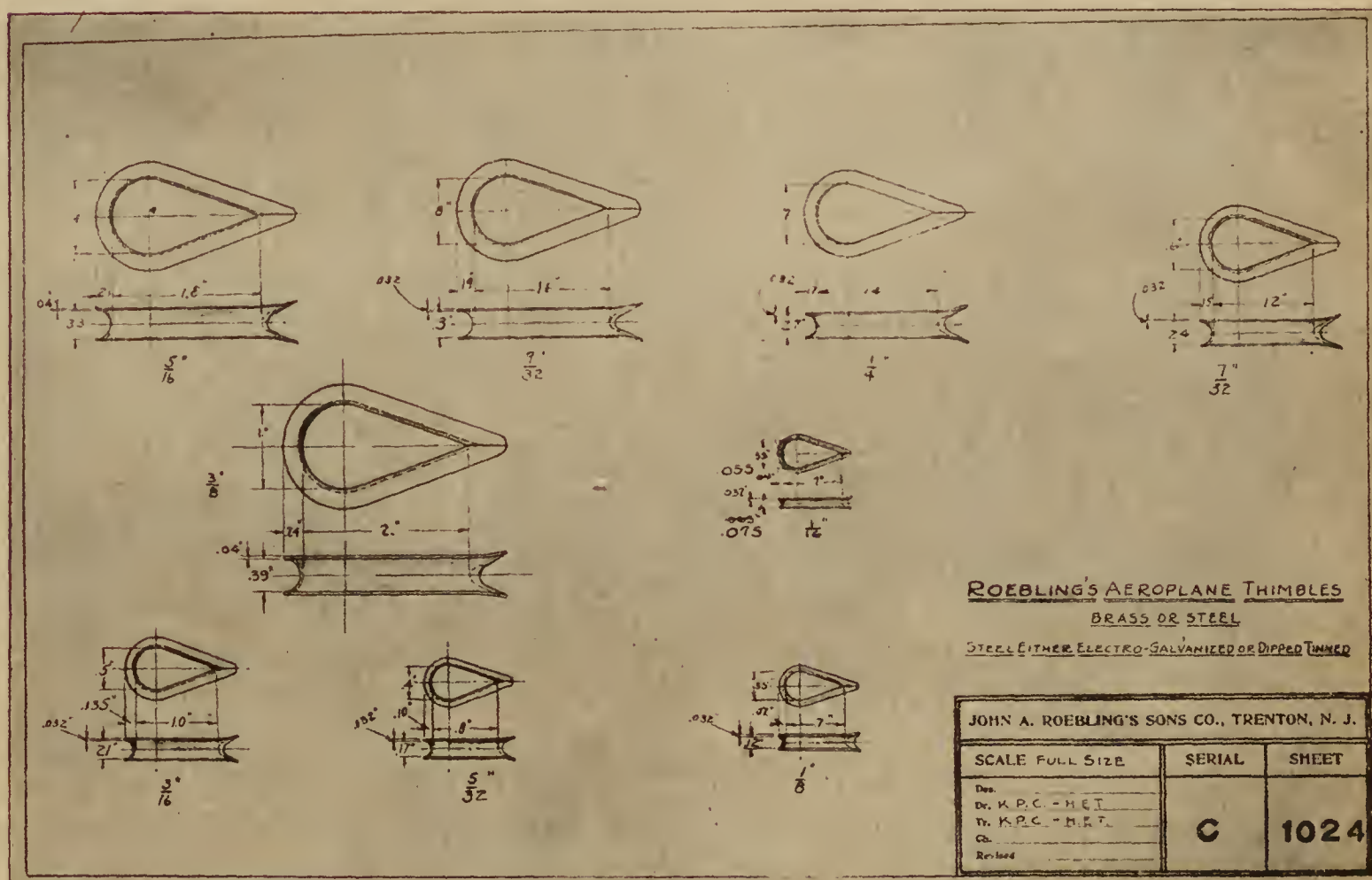


PLATE No. 7

Figure No. 3 shows the result of a test to destruction in the testing machine. Five strands have been broken at the last tuck in the splice. In all the 54 tests the stay failed at this point and never around the thimble,

diameters of $\frac{1}{8}$ inch and smaller. For larger diameters use steel thimbles.

* First Annual Report of the National Advisory Committee for Aeronautics, 1915, Washington.

For the 7 by 19 cord use brass thimbles for $\frac{3}{8}$ inch diameters and smaller, and steel thimbles for larger diameters.

PLATE No. 8

SHOP CONNECTIONS

Figure No. 1—Based upon tests, we believe the eye splice for the 7 by 19 cord is the most satisfactory for all sizes, including $\frac{1}{2}$ inch diameter, unless higher efficiency is required, in which case a socket attachment can be used for the larger diameters.

Figure No. 2—The eye splice is very satisfactory for 19-wire strand for diameters not exceeding $\frac{5}{16}$ inch. For larger

19-wire strand or 7 by 19 cord. The efficiency is 90 per cent.

The wedge "A" and ferrule "B" are the two important members of the connections. After the strand or cord is placed on wedge and through ferrule, the end of same is bent backward on ferrule and then served with wire.

Figures Nos. 2 and 3 show the same type of connection for wire attachment. The efficiency is 94 per cent.

PLATE No. 10 AND PLATE No. 10A

SOCKET ATTACHMENT

We believe the socket attachment can be used to advan-

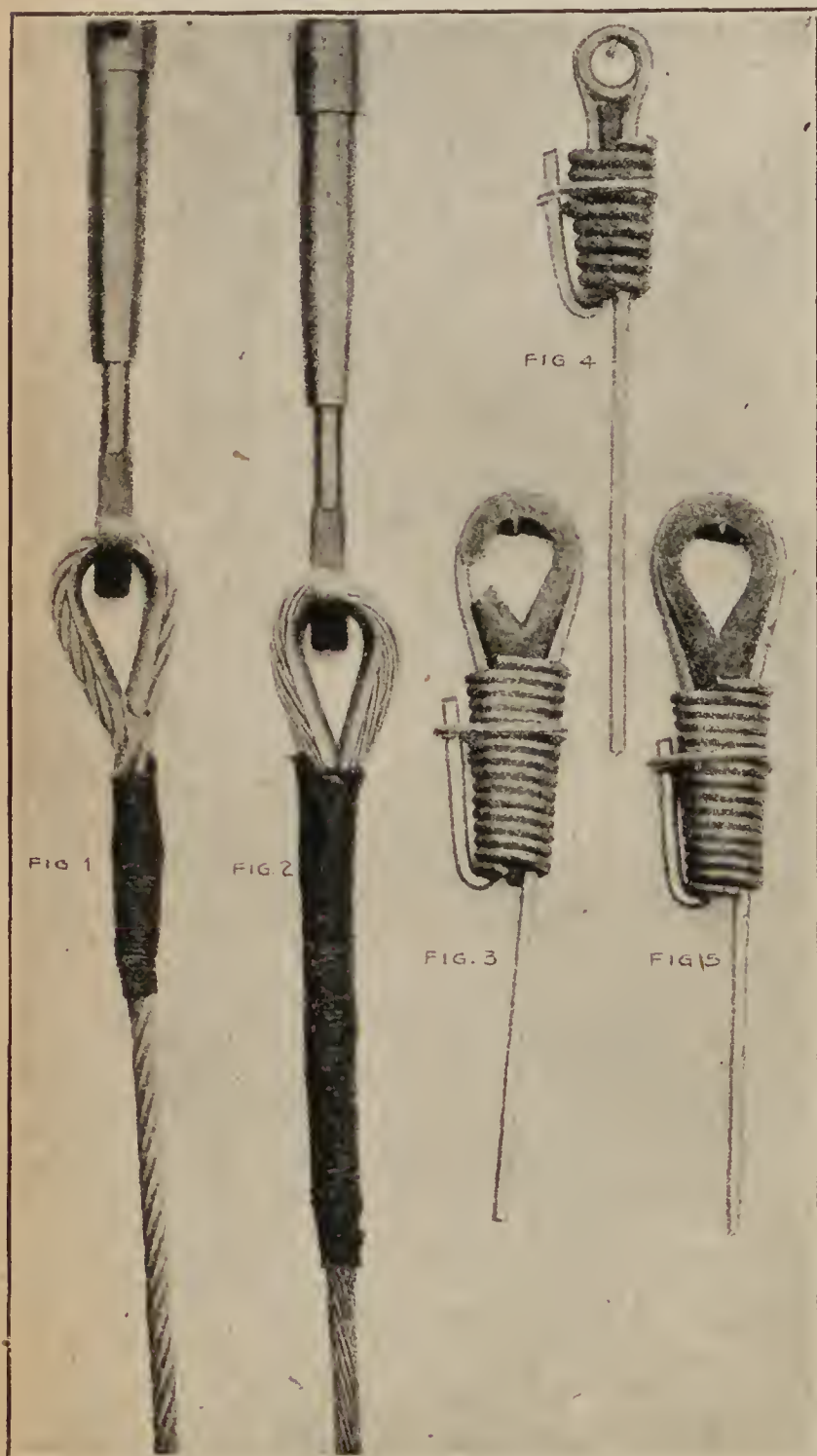


PLATE No. 8

diameters a socket attachment is necessary to get high efficiency.

Figures Nos. 3, 4, and 5—The tapered ferrule and wedge attachment gives maximum efficiency, and we believe can be used to great advantage for single-wire stays.

PLATE No. 9

FIELD CONNECTIONS

The repairing of stays in the field has been given careful consideration, and Figure No. 1 on Plate No. 9 shows a very simple and efficient device for attachment of either

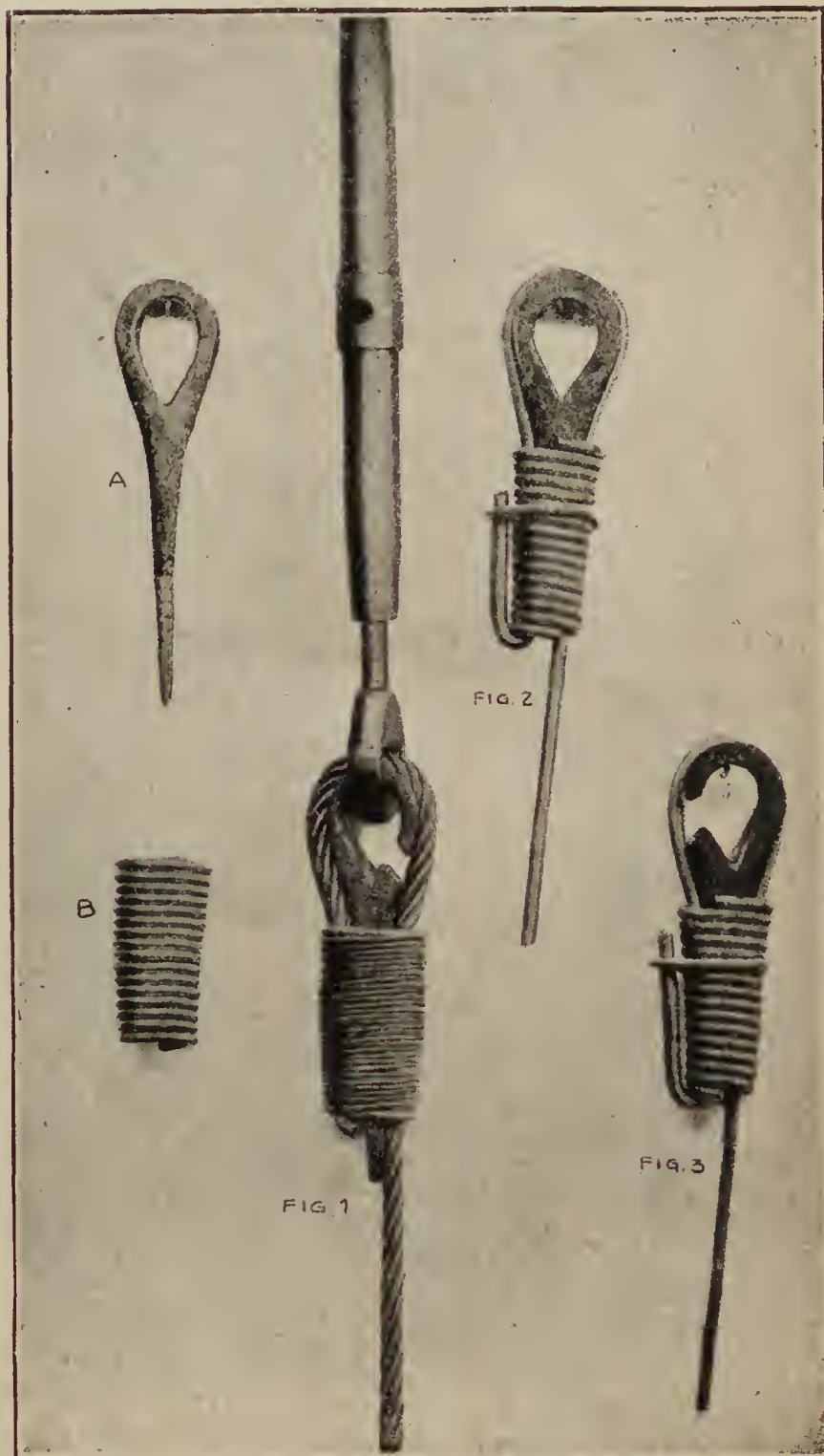


PLATE No. 9

tage in connection with 19-wire strand, especially on the larger diameters.

The efficiency is nearly 100 per cent. and the connection is positive and safe.

We find it necessary to use pure zinc for attachment of galvanized strand.

Plate No. 10 shows two types of sockets—

Figure No. 1 not furnished with adjustment and Figure No. 2 having adjustment.

Plate No. 10a shows the sockets used by the Glenn L. Martin Company, and it is stated their efficiency is 100 per cent.

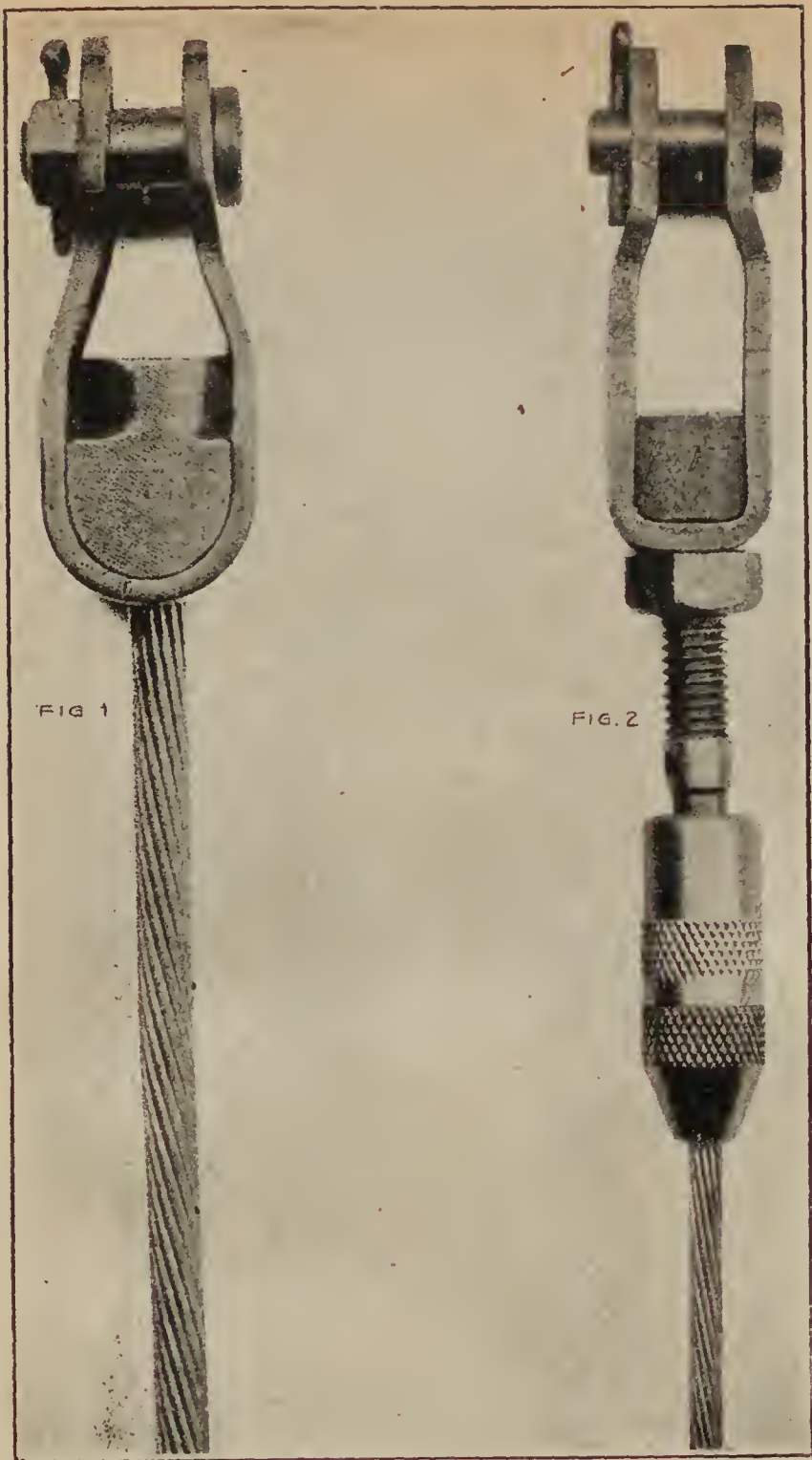


PLATE No. 10

PLATE No. 11

ROEBLING 19-WIRE GALVANIZED AVIATOR STRAND

Figure No. 1 shows a 19-wire galvanized aviator strand with end looped and soldered.

Figure No. 2 shows the result of test to destruction in the testing machine. It will be noted that the break of the seven wires occurs at the centre of the stay and never at the ends. In the series of tests made this connection showed an efficiency of 100 per cent.

Special attention is called to the protective serving of the loop. In case this is not done a thimble must be used. The principal objections to this connection are the use of acid and solder.

Ends Looped and Soldered

Diameter of Strand	Breaking Strength of Strand	Breaking Strength of Stay	Efficiency (per cent.)	Length of Lap	Serving of Lap	Approximate Weight per 100 feet
$\frac{1}{2}$	8,000	8,000	100	20 times diameter of strand	Diameter of serving wire = $\frac{1}{2}$ diameter of strand.	13.50
$\frac{3}{8}$	6,100	6,100	100			10.00
$\frac{1}{4}$	4,600	4,600	100			7.70
$\frac{3}{16}$	3,200	3,200	100			5.50
$\frac{1}{8}$	2,100	2,100	100			3.50
$\frac{3}{32}$	1,600	1,600	100			2.60
$\frac{1}{16}$	1,100	1,100	100			1.75
$\frac{3}{64}$	780	780	100			1.21
$\frac{1}{32}$	500	500	100			0.78

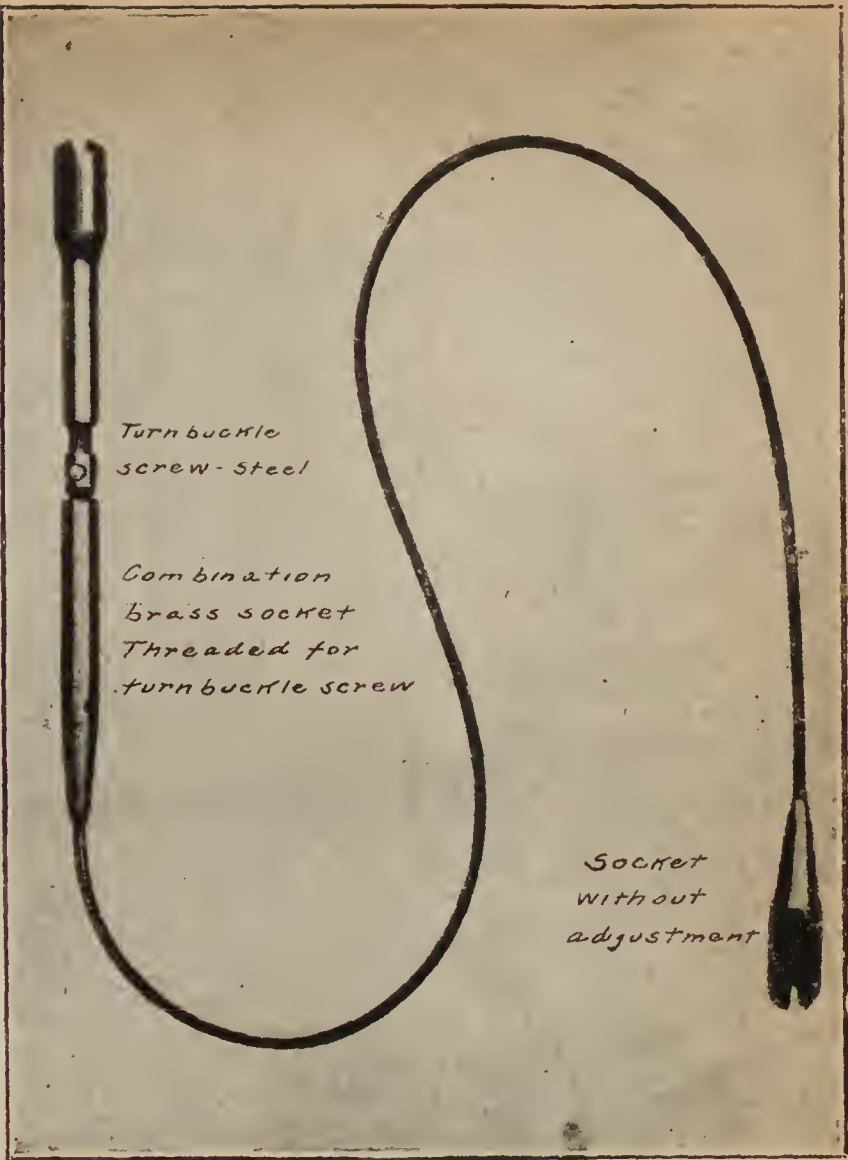


PLATE No. 10a

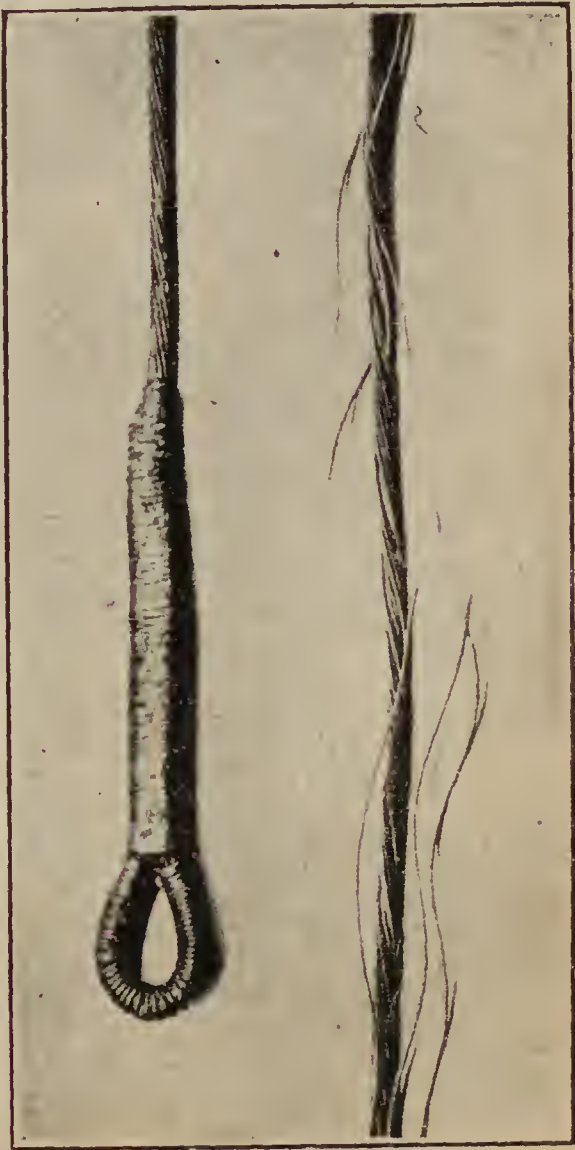


PLATE No. 11

PLATE No. 12

EXAMPLES OF PRESENT PRACTICE

No. 1 shows the solid wire, using a copper tube as a ferrule, and if attached properly will give efficiency of 75 to 80 per cent.

No. 2 shows a 19-wire strand attachment, using a copper tube as a ferrule and bending the strand back and soldering both inside and outside of ferrule. Note that the strand is not protected where it bears on turnbuckle and the strand fails here. The efficiency is low.

No. 3 shows a 19-wire strand attachment where the strand is looped, served, and then soldered. Note the wire displacement in loop.

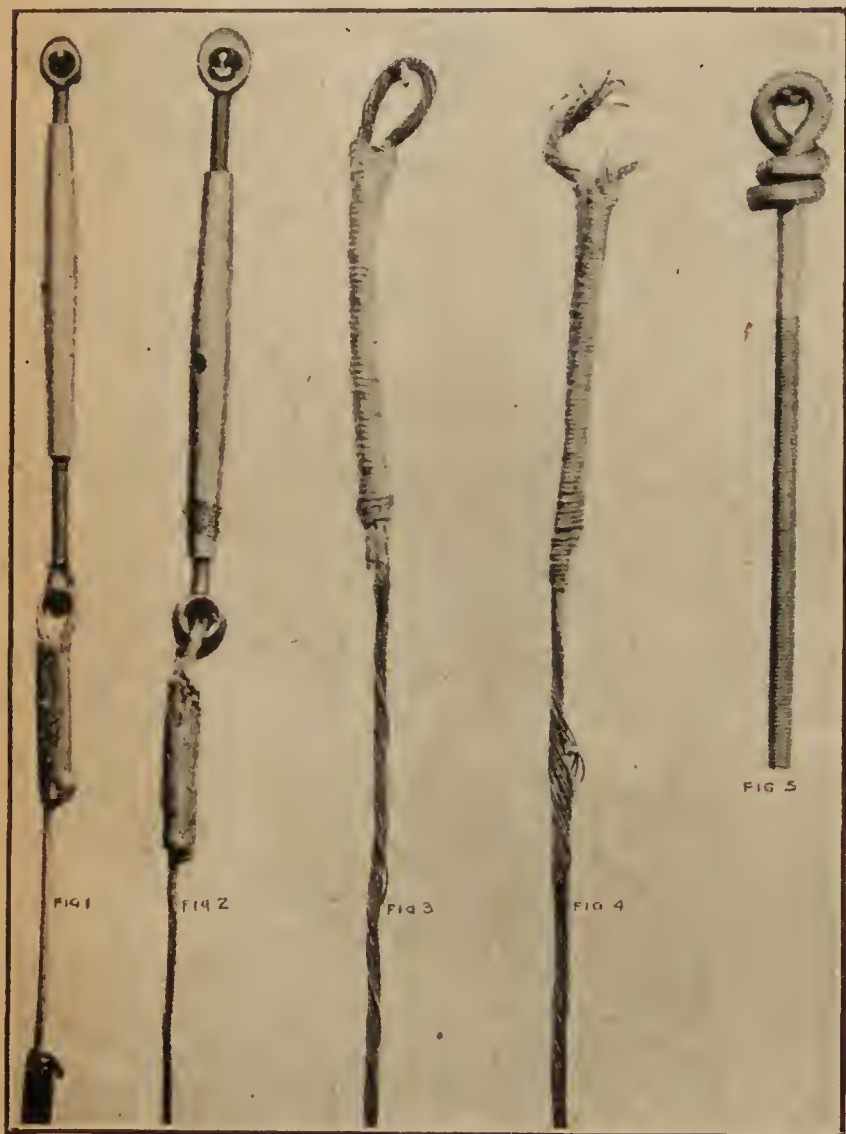


PLATE No. 12

No. 4 was taken from a wrecked aeroplane, and shows point of failure in loop, due to want of protection at this point.

No. 5 shows form of eye for solid wire, which makes it necessary to use medium steel to allow manipulation.

Diameter of Cord	Breaking Strength of Cord	Approximate Weight per 100 feet
$\frac{5}{16}$	7,900	15'00
$\frac{1}{4}$	5,000	9'50
$\frac{3}{8}$	4,000	7'43
$\frac{1}{2}$	2,750	5'30
$\frac{5}{8}$	2,200	4'20
$\frac{3}{4}$	1,150	2'20
$\frac{7}{8}$	830	1'50
$\frac{1}{2}$	780	1'30
$\frac{3}{4}$	480	0'83
$\frac{1}{2}$	400	0'73

PLATE No. 13

ROEBLING EXTRA FLEXIBLE AVIATOR CORD 6 BY 7 COTTON CENTRE

Roebling extra flexible aviator cord is composed of six strands of seven galvanized wires each and a cotton centre. On account of its flexibility this cord is used for steering

gear and controls. This cord is approximately two and one-quarter times as elastic as a solid wire.

Diameter of Cord	Breaking Strength of Cord	Approximate Weight per 100 feet
$\frac{5}{16}$	9,200	16'70
$\frac{1}{4}$	5,800	10'50
$\frac{3}{8}$	4,600	8'30
$\frac{1}{2}$	3,200	5'80
$\frac{5}{8}$	2,600	4'67
$\frac{3}{4}$	1,350	2'45
$\frac{7}{8}$	970	1'75
$\frac{1}{2}$	920	1'45
$\frac{3}{4}$	550	0'93
$\frac{1}{2}$	485	0'81

PLATE No. 14

ROEBLING FLEXIBLE AVIATOR CORD 6 BY 7 WIRE CENTRE

Roebling flexible aviator cord is made with seven strands of seven galvanized wires each. This cord is not

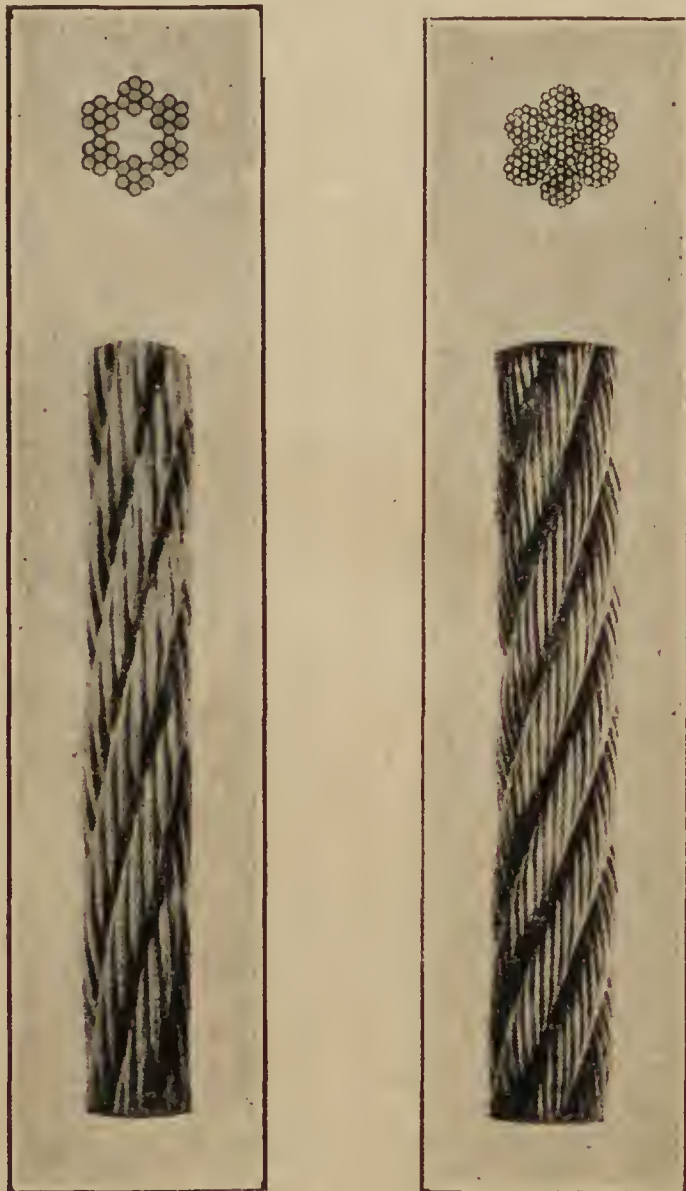


PLATE No. 13

PLATE No. 14

as flexible as the cotton centre cord and is approximately one and three-quarters times as elastic as a solid wire.

PROTECTIVE COATINGS ON STEEL WIRES

NON-FERROUS METALS—ALLOY STEELS

We manufacture wire and cable in non-ferrous metals such as monel metal, german silver, phosphor bronze, aluminium bronze, silicon bronze, brass, copper, etc., but we do not believe that any of these metals will ever prove commercially practicable for the purpose of aeroplane stays or cables. "Maximum strength with minimum weight" appears to be too all-important. In none of these can extreme reliability with high elasticity be so well secured as with steel when it is well protected from mechanical injury and corrosion. For exceptional purposes, the non-magnetic properties of these metals may outweigh their lack of strength and durability in fatigue, making their use imperative, but in the final design the amount thus used

will undoubtedly be the least possible amount permissible under the circumstances. For construction of this kind we would not recommend, without many qualifications, a natural alloy such as monel metal. This material appears to possess excellent non-corrosion properties when used in a relatively large mass, as in a propeller, but there appears to be considerable doubt as to its absolute reliability in uniformly resisting corrosion when rolled into very thin sheets or drawn into wire. To a lesser degree, a lack of confidence must exist in such manufactured alloys as brass, german silver, or bronzes containing relatively large proportions of two or more elementary metals. "Phosphor bronze," "silicon bronze," "aluminium bronze," or similar alloys containing a relatively high per cent. of one element (copper) only, are more "fool-proof" and consequently more reliable and desirable.

An attempt to give the elastic limit and tensile strength of each size of wire, strand, and cable used in aeroplane construction, if same were made of all the non-ferrous metals mentioned above, would involve the publication of quite an extensive report. Confining ourselves to the most suitable of these metals or alloys, phosphor bronze, aluminium bronze, etc., it is a safe and reliable rule to assume that the ultimate strength of such wire or cable or stay will be 50 per cent. of the ultimate strength of the extra high-strength steel listed by us for standard aeroplane use. The elastic limit for non-ferrous metals could not safely be assumed at more than 50 per cent. of the ultimate breaking strain.

The use of vanadium, titanium, and other special deoxidizers or cleansers in the manufacture of steel has undoubtedly resulted in very much improving homogeneity and density of structure in cast, forged, and other hot-worked masses of the metal, especially in the harder alloyed varieties. It is not so certain, however, that the use of these metals has proven necessary or even desirable in making steels of the higher grade for wire manufacture where the enormous amount of cold working and exact heat treatment absolutely inherent to the process of wire manufacture produces eventually a structure finer and more homogeneous than has ever been possible by any other method. The increased resistance to corrosion which the special steels, referred to above, afford, because of their density and uniformity, is more than duplicated by any drawn high-grade wire of the ordinary carbon steels of sufficient degree of manufacture.

Vanadium steels and other steels of their kind have not as yet become established as desirable wire steels. Although strongly urged upon the industry and tried time and again, they have not demonstrated their superiority.

Carefully made high-grade carbon steel affords to-day the most reliable and flexible material for wire, cable, and stays, possessing the "greatest strength for the least weight" known in the wire industry. We know its advantages and we know its disadvantages. The fact that the mechanical properties of steel wire and cable are seriously affected by corrosion is so well known that it must be guarded against. As the damage done is a function of time as well as intensity of chemical or electro-chemical action on the unprotected steel, we have investigated the question of retarding corrosion in the steel itself to as great a degree as possible. We have found that pure iron retards corrosion to a greater degree than the more impure steel—but we have also found that in highly extenuated filaments of these two metals, as in wire, the difference in rate of corrosion is practically negligible, especially when the total life of the wire protected by an external coating such as galvanizing is taken into consideration. We have found the use of special deoxidizers and cleansers questionable and have not adopted them.

The use of protective coatings on steel wire or cable is a very broad subject. Hot galvanized unwiped wire is undoubtedly the best protected wire for the purpose. Very hard wires and very fine sizes of hard wire are likely to become brittle at the temperature of hot galvanizing, and

the next best coating available is, therefore, a tin coating. Both of these metal coatings should be further protected by frequent applications of paint. As a protection to the galvanizing a coat of red-lead paint should be applied after the stay is assembled and the red lead protected by a coat of graphite paint.

The care with which inspections are made from time to time and the efficient maintenance of the paint on the wires really determines the life of the combination. This has been proven absolutely by the very extensive use and treatment of galvanized steel on board ship for many years.

Nickel plating is out of the question for wires to be bent or twisted into cable. Furthermore, nickel is absolutely injurious where the initial purely chemical action on the intact nickel surface ceases and electro-chemical action between steel and nickel begins at such spots when steel is exposed.

We believe, therefore, that tinning and galvanizing are to-day the most satisfactory coatings for steel wire that can be employed. They do not actually represent the final and efficient protection which is necessary in aeroplane construction, as this is secured by the repeated application of paint. These coatings are, however, an efficient guard against corrosion preliminary to service conditions in the plane and also serve to prevent corrosion and consequent damage to the steel cables and stays in service when the paint may have been accidentally rubbed off.

RECAPITULATION

WIRE STAYS

As shown by tests, the terminal fastening, Figures 13 and 14, on Plate No. 1, are efficient, simple, and readily attached, and we believe solve the question.

For shop attachment Figure 13 or 14 would be used in connection with shackles and clevises, and for attaching to turnbuckle eye or other closed eyes use Figure 15.

For field attachment use either Figure 14 or 15.

Plates No. 8 and No. 9 also show these terminal connections.

WIRE SPECIFICATIONS FOR STAY WIRES

Plate No. 2 and pages 10 and 11 of this report give specifications for wire having the highest possible strength, together with the necessary ductility for manipulation, and is the result of many years of experimenting in co-operation with engineers and manufacturers of aeroplanes.

19-WIRE STRAND STAYS

Plates No. 3 and No. 4 give the strength of this strand, also the strength of same as stays, using the thimble eye splice for terminal connection, and, judging from the tests as given, this connection is efficient, neat in appearance, and reliable.

Plate No. 11 gives table of stay strength when the ends of the strand are looped and soldered. The efficiency of this connection is a maximum, but the use of acid and solder are objectionable, and we believe the thimble eye splice with slightly lower efficiency is preferable.

We understand $\frac{1}{4}$ -in. diameter strands is the largest diameter used; but, judging from present development, larger diameter will be required, and it will be found that the thimble eye splice, also the ends looped and soldered, will not give the same efficiency as the diameter increases, and we believe the use of sockets for $\frac{3}{8}$ -in. diameter and larger may be desirable.

Plate No. 10 shows two types of sockets.

For making terminal connection of strand in the field, we believe the arrangement shown on Plate No. 9 is best, as it gives 90 per cent. efficiency and is readily attached by the average man and does not require the use of acid, solder, or blow torch.

7 BY 19 CORD STAYS

Plates No. 5 and No. 6 shows the 7 by 19 rope, which is flexible, elastic, and lends itself readily to thimble splice, giving very uniform efficiency, and has the advantage of higher efficiency for diameters between $\frac{3}{8}$ and $\frac{1}{2}$ in.

We have determined by tests that the socket connection

alone gives higher efficiency than the thimble eye splice on 7 by 19 cord; but, as a general proposition, believe the thimble eye splice is entirely suitable for stay construction.

For a field connection Plate No. 9 shows the most suitable type.

CONCLUSIONS

The tests as given show that it is possible to furnish efficient terminal connections for wire, strand, and 7 by 19 cord, and eliminate the use of acid, solder, and blow torch, and this report as a basis will allow a more thorough investigation on similar lines.

We are unable to determine from aeroplane manufacturers why it is necessary to use the solid wire, 19-wire strand, and the 7 by 19 cord for stays. It is self-evident that the wire stay is less elastic than the 19-wire strand, also that the strand is less elastic than the 7 by 19 cord, also the strength varies considerably, as can be determined by comparison of tables as given before, and to allow a quick comparison we give below :

Comparison of Stay Strength

Material	Diameter	Strength of Material.	Strength of Stay
	Inch.	lbs.	lbs.
Wire	$\frac{3}{16}$	5,500	5,100
Strand	$\frac{3}{16}$	4,600	4,100
7 by 19 cord	$\frac{3}{16}$	4,200	3 500

American practice covers both the wire and 19-wire strand stay, and foreign practice requires the use of 7 by 19 cord for stay.

The table above shows how much more efficient the wire and strand stays are for the same diameter, and, therefore, we are led to believe there are other considerations just as important as strength, such as the elastic stretch of stays, flexibility and fatigue values of material, which may be governed by the construction of stay, and we believe these points should be investigated under field conditions as well as laboratory tests.

We hoped to give in this report the stress-strain diagram for the solid wire, 19-wire strand, also 7 by 19 cord, so that the modulus of elasticity could be determined for any desired load, and elastic stretch of stay calculated for comparison. We were unable to complete our tests in time, and, therefore, if you decide this is of value we will be pleased to submit these diagrams and any other data developed. If vibration of stays is a factor, the relative fatigue value of the three constructions would give interesting data.

Respectfully submitted.

JOHN A. ROEBLING'S SONS CO.,

By C. C. SUNDERLAND, Engineer.

(Investigations under direction of C. C. Sunderland, H. I. Horn, and D. Green.)

AIRCRAFT AS A COMMERCIAL PROPOSITION

CONSIDER any means of transport possessing the following characteristics :—

- Maximum freight transportable ... w lbs. wt.
- Velocity V ft./sec.
- Thrust T lbs. wt.
- Efficiency of propulsion ϵ %
- Useful work done per sec..... $\frac{w V}{g}$ ft. lbs.
- Total work done per sec. $\frac{100TV}{\epsilon}$ ft. lbs.
- Efficiency as freight-carrier $\frac{w \epsilon}{g T}$ %

The above formula is applicable to any means of transport, and is of value in making either of the following comparisons :—

- (a) Aircraft with other means.
- (b) Aircraft with aircraft.

In making such comparisons speed must be a constant for all machines. Efficiency in aircraft may be obtained without undue sacrifice of stability, reliability, etc., by giving attention to the following factors :—

- (1) Increase of the ratio, Useful Load/Total Load.
- (2) Increase of propeller and transmission efficiency.
- (3) Increase of Lift/Drag ratio of planes and reduction of detrimental surface.

It should be noted that as efficiency is inversely proportional to T, it is inversely proportional to V².

According to the above formula, the freight-carrying efficiency of an average aeroplane is about 2.5 %, while that of an airship of similar speed is about 9 %. It is quite logical to suggest that aeroplanes as a means of transport may never be a commercial proposition, because power is used in both support and transport. Although the entire power plant of an aeroplane is used for support, since speed is a *sine qua non*, it is clear that the head resistance or drag of the lifting surfaces is the price paid for the support, and as such is a source of commercial inefficiency. However, there are many factors which point to a great commercial future for the aeroplane—e.g., its mobility in speed and direction, particularly over water, and the use it can make of favourable winds.

AIRCRAFT IN PEACE AND WAR

By WILLIAM A. ROBSON

(Macmillan and Co. 2s. 6d.)

A PERUSAL of this book gives the impression that it has been mainly compiled from articles in the daily Press, and has left a slight feeling of impatience.

It is impossible to apply Major-General Henderson's recent dictum to the book, as the author does not show any symptoms of a desire to be considered an expert, and one remains wondering why the book was written. It seems to belong to the category of harmless, though unnecessary publications which has already been the subject of comment in these columns.

There is, however, one statement that should be controverted for the sake of historical accuracy. On page 87 the author appears to class the Parseval and Astra-Torres ships as among those taken over from the Army by the Navy, which is, of course, not the case.

The chapter on "Airship versus Aeroplane" had been better omitted, as it is not informative, and is, to some extent, misleading. It is stated on page 75 that one of the advantages the aeroplane has over the airship is that it "can attain a far greater altitude than an airship." Turning back to page 25, one finds the answer to this remark, "An aeroplane is not particularly useful on active service just because it can climb 20,000 or 25,000 feet, if it is going to take all day to do so." It does not seem to have occurred to the author that there is a useful connection between these two remarks.

There is a spirit of compromise throughout the whole book which is somewhat irritating. Wherever possible a definite statement is avoided, but where a committal is made it is almost invariably followed by a qualification or retraction.

Possibly this mood is infectious, as the present reviewer finds himself deciding that, after all, there is no particular reason why the book should be condemned; though, on the other hand, he confesses an inability to deduce any particular reason for commendation. He prefers to maintain an attitude of neutrality.

W. M.

PROGRESS OF AMERICAN AVIATION

By ERNEST L. JONES, American Editor

THE UNITED STATES PROGRAMME

THE War Department Advisory Committee on Aeronautics, which has been inspecting the various aeroplane plants of the country in connection with the contract for twelve new Army aeroplanes, visited the Burgess Company plant at Marblehead, Massachusetts, during the week ending May 20. The facilities of the Burgess Company for producing the twelve machines were thoroughly investigated by Captain Walter R. Clarke, Lieutenant Thomas De Witt Milling, and Lieutenant Byron Q. Jones.

Although the War Department specifications called for a Hall-Scott motor of 125 h.p., the Burgess Company, believing this power plant too small for effecting the performances called for, submitted its bid on the basis of the employment of a Curtiss VX motor rated at 160 h.p. With this an air speed of 85 miles an hour with full load was guaranteed, together with a minimum speed not to exceed 46 miles an hour, as required in the specifications. The full load called for in the Burgess Company design totals just over 950 lbs., including 330 lbs. for pilot and passenger, 150 lbs. for instruments and equipment, and fuel and oil for a flight of six hours' duration. With this load on board a



The Wright H.S. used for School Work

climb of 4,000 ft. in ten minutes was also guaranteed. The bid for each machine was \$11,500 (£2,300).

Among the new machines just brought out for tests by the Burgess Company is a Burgess-Dunne flying boat. In this craft the hull used is very similar to that in the Curtiss flying boat, while there has been superimposed on this a biplane of the Dunne type. An interesting departure, however, has been made in that the front edges of the upper plane are straight from the tips to the junction in front, while the lower plane has the sweep back broken on each side of the central section. The power plant is a Curtiss OXX of 110 h.p., and is carried, as in the Curtiss flying boat, between and at the rear of the two planes. Pilot and passenger sit side-by-side in the hull, which also houses the main petrol tank and other supplies. A number of short trial flights have been made in this machine by Aviator Clifford L. Webster, of the Burgess Company, who reports that the machine gets off very rapidly, flies steadily, banks properly, and glides well.

ARMY BUYS TWELVE AEROPLANES

PROPOSALS were opened on May 9 for the furnishing of the Signal Corps with twelve aeroplanes to specifications as herewith. The bids were advertised for April 28. The requirements are briefly as follows:—

Price on twelve military aeroplanes, land reconnaissance type, complete with motor, propeller, instruments, and accessories, in accordance with specifications of April 24, 1916.

Price on spare motors for above described aeroplanes, complete, without radiator or propeller. It is interesting to note that Hall-Scott 6-cylinder 125 h.p. motors are specified.

A complete list, in duplicate, of all component aeroplane parts, with proper designating numbers and prices, shall accompany and form a part of this proposal. The same applies to motor parts.

Drawings in duplicate and, as far as possible, data specified by accompanying forms are to accompany the proposals.

Bidders must guarantee that the aeroplanes proposed will attain an altitude of not less than — ft. in ten minutes, and have a horizontal high speed of not less than — m.h.p. Manufacturers to fill in the guarantee figures above.

The Technical Aero Advisory and Inspection Board of the Signal Corps will determine whether factory facilities and manufacturing ability of bidders are competent for fulfilling the terms of their proposals. Time of delivery and price are important factors.*

ACCIDENT TO H-10

THE Model H-10, wrecked near Alexandria, Va., on May 10, was an experimental machine of the *America* type, equipped with two 160 h.p. M.X. motors.

The accident was caused by the breaking of one propeller, pieces of which struck the other propeller, causing it to break also, and thus making a quick forced landing from a height of 100 feet. There was a strong wind blowing, and one wing struck the water first, which, together with the speed at which the machine was moving, probably over 100 miles per hour, caused the craft to spin about and strike broadside, causing its complete wreck.

None of the five men on board were wearing life preservers. A tug near by rescued the three men who were in sight, and, assuming that there were no more on board, steamed away. When one of the three sufficiently recovered from the shock to tell the captain of the tug that there were two others, the tug returned, but was unable to locate them.

The men lost are: Mr. Louis Grants, Hammondsport, N.Y., and Mr. Charles A. Good, Elyria, O.

Those rescued were: Mr. Theodore C. Macaulay, Newport News, Va.; Mr. Philip Utter, Cleveland, Ohio; Mr. Mayo Dudley, newspaper man. None of the latter are seriously injured, and are rapidly recovering.

This bulletin is sent out to correct the misunderstandings which may have arisen due to the mistakes of newspaper reports.

ALASKAN AIR MAIL ROUTE

THE advertisement for aeroplane routes in Alaska brought one bid. It was on the route from Seward to Iditarod, a distance of 380 miles. The bidder is Earl L. Byers, and the amount was \$49,500 (£10,000) for service twice a week during the entire year, carrying 1,000 lbs. at a trip, and allowing two days to make each trip. The cost of winter service from November 1 to April 30, inclusive, on the Seward-Iditarod route is now \$22,865. Mr. Byers explains satisfactorily the absence of a bond with his bid, and assures the Department that if he can get the contract he can furnish bond within sixty days. He has been advised by radio-telegraph that decision on his bid will be held in abeyance until a satisfactory bond reaches the Department.

Should it be possible to establish a satisfactory aeroplane mail route from Seward to Iditarod it would mean a complete redistribution of mail service in the entire Nome country, and would shorten the time from Nome to an open winter port from 39 to 18 days, or, in other words, reduce the time between the States and Nome by three weeks during the winter months. It would enable the sending of more mail to the Nome country during the winter, and also the sending of more mail to Fairbanks and the interior.

* These specifications will be published in our next issue.

U.S. WANTS AERONAUTICAL ENGINEER

THE Aviation School of the Signal Corps at San Diego is still looking for an engineer and instructor to fill the place made vacant last summer by the resignation of Grover Cleveland Loening, now Vice-President of the Sturtevant Aeroplane Co. The Civil Service Commission has made two attempts to secure satisfactory "timber." However, the United States Civil Service Commission, which has been asked to fill the existing vacancy in the position of Aeronautical Engineer, Signal Service at Large, has not certified eligibles.

BURGESS PROGRESS

Work at the school of the Burgess Company at Marblehead, Massachusetts, is developing at a rapid rate. Two school machines, in addition to two types of naval aeroplanes, are in constant use, with five pupils now actively engaged.

Trials of a new Navy war seaplane, equipped with a Curtiss motor of 160 h.p., have shown this craft to be the fastest ever employed in over-water work. Unofficially the speed made by this machine when driven in its tests by aviator Clifford L. Webster, showed nearly 90 miles an hour. The best previous record for a marine aircraft was 82 miles an hour, made by the 140 h.p. Burgess-Dunne at the Navy aeronautic station at Pensacola early in the present year.

The aeroplane built for Godfrey Cabot, of Boston, has been completed and is flying daily, Mr. Cabot having nearly completed his course of instruction as a pilot. This machine, together with that constructed for Norman Cabot and George R. Fearing, is to be used during the coming summer in connection with the training of an aviation section in the Massachusetts Naval Militia.

In addition to the craft built by the Burgess Company for Massachusetts people, two new machines of the Dunne type are now under construction for Howard S. Borden, of New York, and for the Naval Militia of New York State. These machines will be ready towards the latter part of May, and instruction will be furnished at Marblehead by the Burgess Company for the aviators.

Tests will soon be made at Marblehead, Massachusetts, with a Burgess-Dunne aeroplane of a new type. This is a flying-boat with the hull of the machine constructed along Curtiss lines. The craft has been designed especially for the use of sportsmen, and is meant to combine the merits of the ordinary flying-boat with the inherently staple properties of the Dunne. The hull contains accommodation for pilot and passenger sitting side by side, with dual controls for operation. The power plant is a Curtiss OX of 90 horse-power.

In order to expedite the large amount of test work under way by the Burgess Company, Aviator Stevenson McGordon, of the Curtiss Company, who has been breaking American records in his flights at the Curtiss station at Newport News, has arrived at Marblehead and will put through the unofficial trials a number of new navy aeroplanes.

As the season advances the flying work at Marblehead is showing a notable increase with half-a-dozen or more pupils hard at work. Within a few days, in addition to the Boston men now taking instruction at the school, two New York men are expected: Howard S. Borden, who has recently ordered a machine of the Dunne type, and a member of the New York Navy Militia, who will complete the course and take back with him to New York the machine now under construction for the organisation in the Burgess Company's plant.

Plans are rapidly advancing for the formation of the Aeronautics Section of the Massachusetts Volunteer Militia, in which the Boston men now taking work at the Burgess School are interested. The necessary enrolment of 23 names has been completed.

TRANSCONTINENTAL COMPETITION

To develop the aerial defences of the U.S.A., the Executive Committee of the Aero Club of America has decided to hold a Transcontinental Aeroplane Competition, with a first prize of \$20,000 (£4,000), and a possible total of over \$100,000 (£20,000) in prizes and a splendid trophy offered for annual competition by Mr. Ralph Pulitzer, the owner of the New York World.

The plans to hold this Transcontinental Aeroplane Competition, which have been developed by the aeronautical authorities after lengthy consideration of the aeronautical needs of the country, was started as a result of Mr. Pulitzer's offering the trophy for annual competition.

COMMERCIAL TESTS FOR STURTEVANT MOTORS

In our issue for March 29, 1916, we printed a chart of the tests of a Sturtevant motor of 140 h.p. The chart we reprint herewith reproduces the conditions of the test more exactly, since it was the

official test carried out by officers of the United States Navy. The figures will speak for themselves. Essential details relating thereto will be found in our issue for March 29.

B. F. STURTEVANT COMPANY, Hyde Park, Boston, Mass.														
MOTOR TESTING DEPARTMENT														
Model 5	Factor No. 5051	Brake Load	Length of Arm	Temperature	Date 12/27/1915									
Type					Timing									
Time	Rev. No.	R P M	Torque Pounds	Static Thrust	Brake H P	Max.	Min.	Consumption Gallons	Gasoline	Oil	Per Hour	Per Hour	at end of run	Remarks
19.45	1640			122	134									
10.80	1187	118 1/2	119	141	142									
10.15	1175	117 1/2	126	143	144									
11.30	1190	119 1/2	120	142	143.9									
10.45	1170	117 1/2	124	141	142.7									
11.00	1170	117 1/2	120	142	142.5									
11.10	1165	116 1/2	120	142	142.1									
12.00	1640	Tach	122	134										
2.05	1820	Counter	122	133										
1.15	1820	Tach	122											
1.11	1852	Counter	122											
Intake: Closes after Bottom Center, Opens after Top Center Exhaust: Opens before Lower Center, Closes after Top Center Magneto Timings: D. V. Open Exhaust, Mobil Oil B, Oil pres 35 lbs. Burgess Propeller #160, 9x7 ft pitch Test in Charge of: [Signature] O.K. By: [Signature] U.S.N.														

MODEL AEROPLANES—XXXIII

By F. J. CAMM

ELEVEN ribs connect the spars of the top plane and nine those of the lower, the camber of each being the same, i.e., the same depth of camber is maintained throughout, no "wash out" being introduced. Before the wings are covered, the angle plates to which the inter-struts are fixed must be bound on; and these are cut from thirty-gauge sheet tin. They should be cut less in width than the spar to which they are attached, in order that their sharp edges do not cut through the binding. To prevent the plates from moving they should be lightly sunk into the wing spar with two centre punch dots, and a film of glue should also be spread over the face of the plate coming in contact with the spar.

The inter-struts are streamlined in cross section, but they are to be left rectangular in section at their ends, to provide a flat surface for the plates to bed home on. The ends of the plates are turned back over the binding, which may be of the light machine variety.

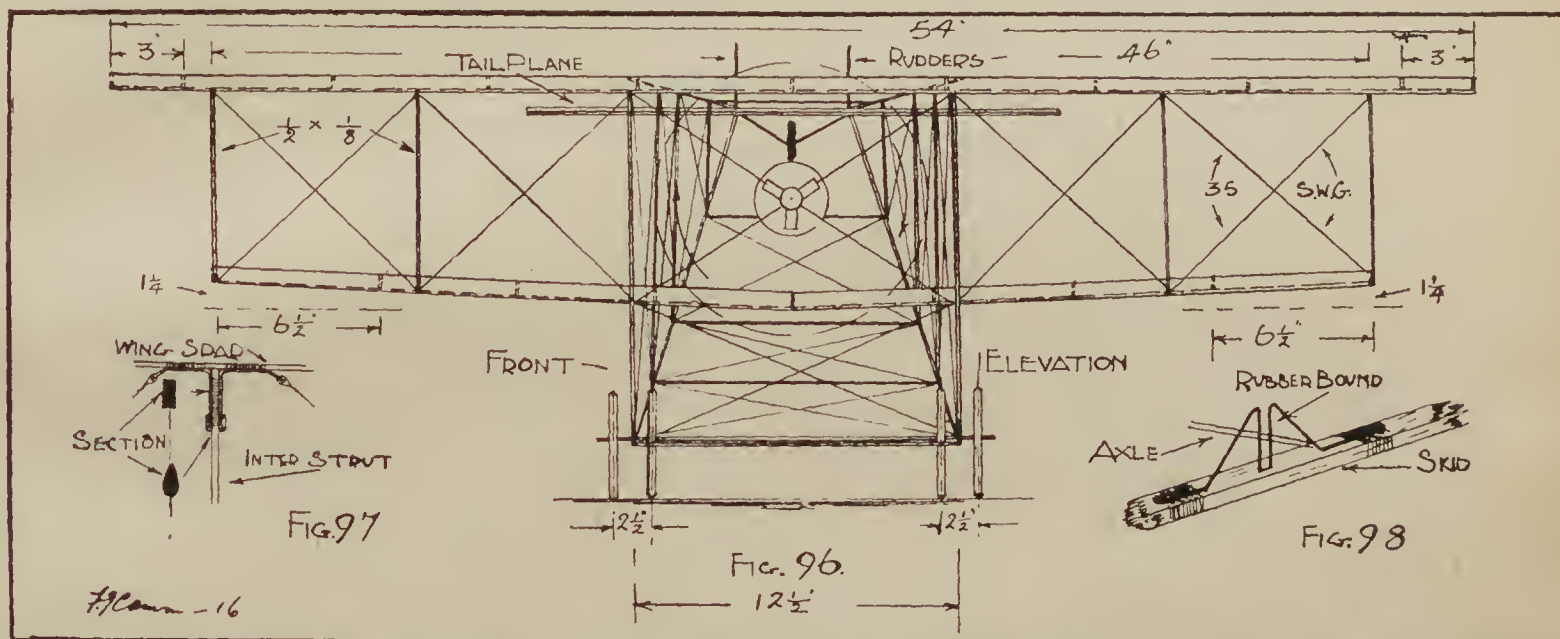
The lower ends of the inter-struts are cut off to the same angle as the dihedral on the lower plane, to avoid distortion of the plane. Spruce or American whitewood may be used for them, the greatest cross section being half by an eighth of an inch. The greatest cross section is situated at the middle of the strut, from whence it tapers to three-

are wire bound to the skids and lightly soldered. The bottom plane only must be covered, as it will be far easier to cover the top plane when the machine is assembled, for it would be a difficult matter to secure the top outriggers to the spars were the fabric attached.

Having assembled the outriggers and completed the bracing of it, it will be possible to attach it to the wings.

Small elliptical holes are cut in the fabric of the lower wing, through which the central supports or stanchions pass, and the bottom plane seated home in the notches alluded to and illustrated in the last article. Next, the top outrigger ends are fitted up, being cut off to correct length and halved on to the wing spars as sketched in Fig. 99. The vertical support is then glued, pinned, and cross-bound to the outrigger.

Great care will be necessary to ensure that the outriggers are quite central with the planes. The point I wish to make clear is that if in the fitting of the top outriggers one is cut even a thirty-second of an inch short, the tail end of the machine may be three-quarters of an inch out of centre. In order to check inaccuracy in this direction it would be advisable to mark the centre of the horizontal tail member, insert a drawing pin, and take the measurement to the corner of the wing tip, on both sides of the model, and the



sixteenths by an eighth. Fig. 97 shows the attachment of the inter-strut to the wing spar. I have sketched in Fig. 98 the brackets forming the guides for the axle, and also the supports for the rubber shock absorbers. Piano wire is used for them. The width of the guide should be

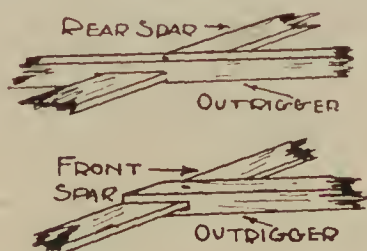


FIG. 99

such that the umbrella-ribbing which constitutes the inner portion of the axle rides freely within it. The wheel axles are cut from sixteen-gauge piano wire, and they are soldered to the umbrella ribbing, being sunk into the channel of the latter, bound with thirty-gauge tinned iron wire, and then soldered.

Ordinary elastic, as used for a rubber-driven model, can be used as the shock absorber, and it should be neatly and fairly loosely bound to the vertical guide, the axle, of course, being first seated therein. In order that the absorber brackets may maintain a vertical position, their ends are shaped to a form similar to the letter U. They

outriggers should be temporarily lashed to the wing spars and gradually adjusted until they are located centrally with the planes. Perhaps it may be interesting to here mention that this is the method employed in locating the fuselages of full-size machines.

The bracing of the planes should now be undertaken. All lift wires should first be fixed, commencing from the wing tips. Just sufficient tension should be placed upon each wire to ensure rigidity. A wooden straight edge should be used to reveal any distortion of the spar. The top plane must be given a slight dihedral, so that when the anti-lift wires are inserted it assumes a perfectly parallel position.

There are a few further constructional details to be dealt with, but these will form the subject of the next article.

(To be continued)

REPLIES TO CORRESPONDENTS

G. W. G. (Scarborough)—Provided that the same speed is obtained, the biplane should fly the better of the two, all other things being equal, but the point is extremely controversial. It is very doubtful whether the same speed could be obtained without varying other vital factors which would interfere with the proposition.

A. S. W. (Bromley)—Replying to queries in the order given: (1) 27 in. span, 4 in. chord, tail 10 in. by 7 in.; (2) $8\frac{1}{2}$ in. diameter, 16 in. pitch; (3) seven strands; (4) birch $\frac{5}{16}$ by $\frac{1}{8}$ full is most suitable; (5) 250 yards.

MODEL EDITOR

STATEMENTS IN PARLIAMENT

HOUSE OF COMMONS

May 29—*Total Raid Casualties*—Mr. H. Samuel (Cleveland), answering Mr. Kellaway (L., Bedford), said: The total casualties caused by hostile attacks from the air in Great Britain since the outbreak of war up to the present date are as follows: In the 44 air raids 409 persons were killed, including 222 men, 114 women, and 73 children, and 1,005 persons were injured. These figures differ slightly from the totals of those published from time to time owing to the fact that some persons reported as injured subsequently died, and a few additional cases of injury of a minor character not known to the police at the time were afterwards reported.

May 31—*Lord Northcliffe and the Air Service*—Mr. Tennant (Berwickshire) asked by Mr. Hogge (L., Edinburgh, E.) whether Lord Northcliffe, who had been arraigning the Air Service for many months, had been asked to give evidence before the Air Inquiry, whether he had refused, and if so, what were his reasons, replied: It is, of course, for the president and members of the Air Committee to settle their own procedure and what witnesses they will call. I am not aware whether they have thought fit to call Lord Northcliffe or not, nor whether, if he has been called, he has accepted or refused, nor in the event of his having refused what were his reasons.

June 1—*The Air Service*—Mr. Billing (Hertford) said he had had occasion to criticise the Government on air questions, but before the House adjourned he wished to congratulate them on the vigorous steps they had now taken. They had at any rate gone in the right direction.

After expressing sympathy with Mr. Tennant in the injury to his son, Mr. Billing said that when he read of the accident in which Lieut. Tennant had been injured, and which stated that the pilot, Captain Grime Jones, was killed, knowing the type of machine was a BE 2 C, No. 4335, he could hardly believe that it was the pilot who had been killed. It had never before come to his knowledge that the pilot had been killed in one of these machines, and he therefore proposed to ask if that were so; but before he could take any steps he received two letters from people interested in Captain Grime Jones asking him to call attention to the fact that these newspaper reports, released by the Press Bureau, were wrong, and that Captain Grime Jones was not the pilot of this machine. For a pilot to meet with an accident of this description was, from information he had received, entirely due to inexperience and inefficiency. It was rather hard for a man who was not responsible for the accident and who was killed to be accused of being responsible. Captain Grime Jones was not piloting the machine; neither was he in any way responsible for the accident or his own death. Very large orders were about to be given for engines and aeroplanes, and upon the types ordered a great deal would depend. He hoped the representative of the Air Board would urge upon that Board the inadvisability of giving large orders for types of machines which, although they were of official design, were admittedly the most inefficient that the world could produce. He knew that Lord Curzon was earnest and anxious to get on with his gigantic task, and to regain for this country the supremacy of the air, and he hoped Lord Curzon would not be led astray by officials who wished to see machines which were the offspring of their own imagination in use regardless of cost or efficiency.

Major Baird (Rugby), in reply, said the Air Board were anxious to receive suggestions from persons of experience which would help them in the fulfilment of their task. Engines and aeroplanes could not be ordered without a great deal of examination, and from the nature of the case a machine might become obsolescent before the order was completed. The Board realised to the full the need of keeping pace with the Germans in regard to their service, and of doing better than them if we could, and the aeronautical officers who served on the Board as the technical advisers of the President were fully competent to give advice from their experience and practical knowledge. If the hon. member had thought more over the accident to which he had referred probably he would not have brought the case before the House.

Mr. Billing said that if the Government officials had corrected the reports which had appeared in the Press during the last three days he would not have brought forward the case. In justice to the memory of the man he thought attention should be called to the case so that a correction should be made.

Major Baird replied that if a correction were necessary it would be made. The machine referred to was of dual control, and the man who unfortunately was killed was not the pilot.

AIR INQUIRY.

The third meeting of the Government Committee met on June 1, at Westminster Hall, Mr. Justice Bailhache again presiding.

The first witness was Sir Alfred Mond, who explained various points in the speech he made in the House of Commons on March 28.

Members of Parliament had difficulty in getting what might be called legal evidence. Personally, he had not made any allegations against the eminent men who were conducting difficult departments in difficult circumstances. On February 15 last Mr. Bonar Law spoke of the great scarcity of material and the need of engines. He (Sir A. Mond) asked: How long ago was it that this engine shortage occurred, and what steps were taken to communicate with manufacturers who could supply these engines? No doubt there was a difficulty in obtaining labour, but great as the difficulty might be, it was not an impossibility. With regard to inventions, in one case a young engineer had designed a novel type of quick-climbing machine, which was favourably received by the authorities and the War Office, and they asked him why he did not have it built. This man explained that he had no money, and he was then told he ought to get someone to finance him.

The Chairman observed that these people who had grievances against Government Departments ought to give the Committee an opportunity of investigating them. It was not quite fair for them to decline to give their names.

Sir A. Mond said his next point had reference to the Fokker machine, which he understood was offered to the British Government. The Under-Secretary said it was not the Fokker, but another machine invented by Mr. Fokker. His criticism was that it seemed a pity they could not keep in touch with the inventor of the Fokker or any other new type, and secure it for ourselves rather than let the Germans have it.

General Henderson intimated that he would call evidence at the proper time in regard to motor works not being employed in building engines, and asked Sir A. Mond whether he could state of his own knowledge, or could find anyone who could state before the Committee, that outside designs of engines had been submitted to the Royal Aircraft Factory.

Sir A. Mond: I dare say I could. I have heard of such a case.

You say we have no power to spend money on inventions. Have you any knowledge yourself of the inventions we are trying?—No; but are you satisfied you can spend the money you want without being interfered with?

General Henderson: I have not been stopped yet.

Mr. A. Lynch, M.P., was next called, and he said he wished to clear up two or three points in regard to the evidence he gave a fortnight ago. He went on to say that he had a letter from an inventor who had submitted a new principle—or at any rate quite original details—to the War Office, and they told him that to obtain a hearing he must be in a position to say that he had constructed an aeroplane of that type and had actually flown it. That, said Mr. Lynch, was not the proper way to deal with constructors. He admitted, however, that he had recently come to the conclusion that inventors might be divided into three classes—(1) inspired men, or (2) inspired idiots, or (3) where the word "inspired" would not be in order. After his experience he had now more sympathy with the War Office in the matter of dealing with inventors than he had previously. At the same time, though an invention might show an amount of ignorance of the principles of science, there was nearly always to be found the germ of some good idea.

THE AIR BOARD'S ACCOUNT

The Air Board has decided to publish at intervals a résumé of the principal incidents described in the reports received from the Royal Naval Air Service and the Royal Flying Corps in the various theatres of war. The incidents selected are such as appear to be of general interest to the public.

It must be borne in mind that a great deal of extremely valuable and dangerous work is being carried on which does not lend itself to publication. The following is the first of these communications:—

ROYAL NAVAL AIR SERVICE (FLANDERS)

MAY 4

Nineteen machines carried out a raid on Mariakerke Aerodrome and fifty 65-lb. bombs were dropped. Heavy anti-aircraft fire with incendiary shells was encountered; two of our machines were lost. The rest returned in safety.

MAY 20

Flight Sub-Lieutenant A., in a Nieuport scout, when four miles off Blankenburghe, observed a German seaplane. Diving down to 4,500 ft., the pilot succeeded in getting above and behind the enemy,

and fired 25 rounds at close range. The enemy machine was observed to swerve and dive into the water. It sank, reappeared, and finally sank.

MAY 21

(a) During the early hours an Allied raid was carried out on the enemy's aerodromes and places of military importance. Sixteen R.N.A.S. machines dropped thirty-eight 65-lb. bombs and seventeen 16-lb. bombs on Mariakerke Aerodrome. One seaplane dropped one 100-lb. and two 65-lb. bombs on the Solvay Works, Zeebrugge. All these machines returned safely with one exception.

(b) An attack was made upon Dunkirk by hostile aircraft. Several British machines went up with the object of cutting off the enemy on their return journey, in the vicinity of Nieuport. Flight Sub-Lieutenant D., in a Nieuport scout, attacked three machines at a range of 400 yards. He opened fire on one machine and observing another about 900 ft. above him making seawards, gave chase and fired the rest of the tray. He then reloaded and, climbing to 10,000 ft., encountered a large two-seater, which opened fire at long range. Flight Sub-Lieutenant D. opened fire and observed tracer bullets entering the

maehine, which started to smoke violently and nose-dived towards the sea. Another officer who was in the air at the same time states that he observed in the same locality what appeared to be a machine on fire, enveloped in a volume of black smoke. A fourth hostile machine was encountered, and fired upon until Sub-Lieutenant D.'s ammunition had been expended.

(c) Flight Sub-Lieutenant E., in a Nieuport scout, when six miles out to sea, over Zuydcoote, observed five hostile machines together and another one a little way behind. Climbing rapidly the pilot attacked the last one at close range of 100 yards. The hostile machine suddenly dived steeply, but the pilot was unable to ascertain the result, as he was attacked from behind by three scouts, probably Fokker biplanes, at a range of 100 ft. Flight Sub-Lieutenant A. turned round to meet them, and reloading continued to fire. These machines, however, made good their retreat over the lines.

(d) Flight Commander A., in a Nieuport scout, followed the raiders out to sea, opening fire when off Mariakerke. He closed with three machines, one of which was seen to topple over suddenly and nose-dive out of sight. Reloading, the pilot attacked another machine, which, after a few rounds, was observed to dive steeply. The third machine did not attempt to engage, but flew back over the lines. It is probable that one, and possibly two, of these machines were destroyed.

MAY 22

Flight Sub-Lieutenant G., in a Nieuport scout, observed five hostile machines in close formation and one farther in the rear, which he attacked at very close range and from underneath, the tracer bullets entering the fuselage. The observer of the enemy machine fired a few rounds, and then broke off, as though killed or wounded, our machine still being an easy target. The other hostile machines drew away.

ROYAL FLYING CORPS (FRANCE)

MAY 4

Lieutenant D., pilot, and Second-Lieutenant D., observer, attacked two hostile aeroplanes, a Roland and an Aviatik, over Fromelles. The hostile machines came from the north-east at 8,500 ft. and 8,000 ft. respectively. Lieutenant D. steered straight towards them. The Roland opened fire at 150 yards, and Second Lieutenant D. at 70 yards. The Roland turned, the observer standing up to fire. Lieutenant D. followed, and the Aviatik came up behind him and opened fire. Both pilot and observer of our machine were now firing, being between the two hostile machines. They got within a few yards of the Roland, which ceased fire and dived steeply, but apparently under control, towards Wavrin. The observer was apparently hit, as he disappeared from view and firing ceased. Lieutenant D. then turned towards the Aviatik, which, however, went down in the direction of Wavrin. Lieutenant D.'s machine was badly damaged, but pilot and observer were unhurt.

Second Lieutenant C., on a de Havilland, sighted a hostile machine flying south at about 1,500 ft. between Hem and Clery. He dived down and overtook the German, who also dived close to the ground, firing about 12 rounds at a range of 50 yards. The German machine tried to land, but hit a wire fence and broke up. Second Lieutenant C. climbed to 200 ft., when he again dived, firing the rest of his drum at the pilot and observer, who were running across the field. One of them fell and the other took refuge in a shed. Meanwhile Second Lieutenant's C.'s thumb switch had jammed and he was forced to land, but the bump on landing loosened the spring, and he got off again, crossing the lines at about 500 ft. under heavy fire. Captain T. was killed by anti-aircraft fire. His observer, Second Lieutenant H., climbed back into the pilot's seat and found the rudder jammed. He, however, managed to land the machine in our lines and escaped unhurt.

MAY 16

COMBATS.—Twenty-seven combats in the air took place. Lieutenant D. and Corporal S. on an F.E. attacked an Albatross when approaching

Lille. Half a drum of ammunition was fired, and the hostile machine spiralled rapidly down, firing occasionally. Later, the same machine was observed climbing again over Lille, and following the F.E. at about 500 yards. Lieutenant D. wheeled sharply and opened fire at close range. The Albatross sheered away to the right, followed by the F.E. still firing at close range. The hostile machine then went down rapidly, and was seen to strike the ground at a cross-roads south of Lille. Smoke rose from the spot and only one wing was visible. The F.E. was then attacked by a Fokker monoplane, which was driven off.

Second Lieutenant B., on a Bristol scout, when flying at 12,000 ft., saw an Albatross at 5,000 ft. over Givenchy. The hostile machine turned towards Beaumont, followed by Lieutenant B., who opened fire when about 2,000 ft. above, and continued until within a few yards. The hostile machine turned and got into a nose-dive, and when about 2,000 ft. from the ground was seen to turn upside down.

MAY 19

COMBATS.—Lieutenant P., on an F.E. observer, Air Mechanic H. on patrol north-east of Ypres, sighted three hostile machines. He engaged one of them, which turned and met him face to face, being slightly below him. Fire was opened, and the enemy machine side-slipped, and then dived vertically. The F.E. saw no more of the hostile machine.

Sergeant N., on a de Havilland, sighted a hostile machine over Bixehoete flying north. He flew towards Langemark, and cut off the hostile machine from its own lines. It was then below him, and did not observe him. He dived and fired a drum, but while reloading lost sight of the machine. One hostile machine was seen to fall in the enemy's lines. This was probably the first of the above machines.

Lieutenant R., on an F.E., observer, Lieutenant M., encountered a Fokker. Fire was opened at 50 yards, and the enemy machine side-slipped, turned on its back, and crushed to earth. Its fall was observed by a B.E.

MAY 20

An Aviatik was engaged by three of our machines over Adinfer Wood—viz., two F.E.'s, pilots: Captain A. and 1/A.M. C., observers: Second Lieutenant C. and Corporal H., and a B.E. 2c., pilot: Lieutenant F., observer: Second Lieutenant C. The B.E. attacked first. Air Mechanic C. then dived from 9,000 ft. and attacked the Aviatik at 5,000 ft. Finally, Captain A. closed to within 20 yards, and fired two drums at the Aviatik, which went down in a nose-dive, and crashed into the trees.

An Albatross was attacked by three of our machines over Poziere, a Martinsyde, pilot: Captain S., and two de Havillands, pilots: Lieutenant W. and Second Lieutenant T. Lieutenant W. attacked first, opening fire at 50 yards, and turned aside owing to his gun jamming. Captain S., on the Martinsyde, then attacked at 30 yards' range, apparently without effect. Second Lieutenant T. then dived on to the hostile machine from above and fired a drum at 40 yards from behind it. The hostile machine burst into flames and fell between Poziere and Contalmaison.

MAY 21

Second Lieutenant T., on a Martinsyde, flying at 12,500 ft., saw an Albatross over Fromelles at about 9,000 ft. He dived at it, reserving his fire till within close range. Both machines were diving at high speed with engines on. Second Lieutenant T., having expended one drum, changed, and continued the attack. The enemy endeavoured to manoeuvre out of fire, turning in all directions, but Second Lieutenant T. manoeuvred his Martinsyde, and managed to keep the enemy under fire at intervals. At about 4,000 ft. over the south-west corner of Lille the machines were so close that they nearly collided; but the enemy after descending in a vertical dive recovered himself and escaped.

AIRCRAFT IN ACTION

ENGLAND

May 29—The Wily Hun—Fine sunny weather yesterday (May 28) suitable for aerial work. Much successful work was accomplished by us, and few German aeroplanes were seen.

May 29—Royal Flying Corps' Admirable Work—The following references to the admirable work of the R.F.C. in France and Belgium occur in General Sir Douglas Haig's dispatch covering the period from December 19, 1915, to May 19, 1916. In the air there is seldom a day, however bad the weather, when air craft are not busy reconnoitring, photographing and observing fire. All this is taking place constantly at any hour of the day or night, and in any part of the line. Two squadrons given below were specially mentioned for their good work during the period under review:

No. 2 Squadron, Royal Flying Corps.

No. 6 Squadron, Royal Flying Corps.

"I take this opportunity to bring to notice the admirable work which the Royal Flying Corps has continued to perform, in spite of much unfavourable weather, in carrying out reconnaissance duties, in taking photographs—an important aid to reconnaissance which has been brought to a high pitch of perfection—and in assisting the work of our artillery by registering targets and locating hostile batteries. In the

performance of this work they have flown in weather when no hostile aeroplane ventured out, and they have not hesitated to fly low, under fire of the enemy's guns, when their duties made it necessary to do so. They have also carried out a series of bombing raids on hostile aerodromes and points of military importance. A feature of the period under review has been the increased activity of the enemy's aircraft, in suitable weather. But the enemy's activity has been mainly on his own side of the line, and has aimed chiefly at interrupting the work carried out by our machines. In order to carry out the work in spite of this opposition, which was for a time rendered more effective by the appearance in December of a new and more powerful type of enemy machine, it has been necessary to provide an escort to accompany our reconnaissance aeroplanes, and fighting in the air, which was formerly exceptional, has now become an every-day occurrence. The observers, no less than the pilots, have done excellent service, and many fine feats have been performed by both. Developments on the technical side of the Air Service have been no less remarkable and satisfactory than the progress made on the purely military side. Much inventive genius has been displayed; and our equipment for photography, wireless telegraphy, bomb-dropping, and offensive action generally has been immensely improved, while great skill has been shown in keeping the flying machines themselves in good flying condition."

May 30—Hostile Machines Forced Down—Yesterday (May 29) enemy's aircraft were more active than usual. One of our machines was shot down as the result of a combat in the air, falling in our own lines. A hostile machine was forced down out of control within its own lines.

May 31—Unfavourable Flying Weather—Yesterday (May 30) weather was unfavourable for flying, but in spite of this good work was done by our aeroplanes.

June 1—Enemy Machine Driven Down—Yesterday (May 31) our aeroplanes, while on reconnaissance, had a long running fight with three hostile machines. One enemy machine was driven down and one of our machines is missing. During the night hostile aircraft dropped eight bombs on Poperinghe, doing no damage.

(See German Official)

June 2—Enemy Machine Brought Down—The clear weather enabled much successful aerial work to be done yesterday (June 1). There was a certain amount of fighting in the air, as a result of which one of the enemy's machines was brought down and subsequently set on fire by our artillery, whilst another was driven to the ground damaged just behind the enemy's lines. One of our balloons was carried away by a sudden gust of wind and driven over the enemy's lines. Both the occupants reached the ground safely inside our lines by means of parachutes.

June 3—Aeroplanes' Successful Work—Yesterday (June 2) our aeroplanes, favoured by fine weather, accomplished much successful work.

June 4—Raid on Military Points—Yesterday (June 3) a squadron of our aeroplanes bombed some points of military importance. Considerable damage is believed to have been done. One of our machines was brought down in the enemy's lines by gunfire. The remainder returned safely. Hostile aircraft inactive.

(See German Official)

FRANCE

May 29—Five Enemy Machines Brought Down—On Sunday (May 28) our pilots were engaged in 15 aerial fights with German aeroplanes. Two of the latter were brought down. One fell in flames near Monthois (Argonne) and the other in the region of Amifontaine (north of Berry-au-Bac). During a range-finding flight one of our pilots was attacked to the north of the Aisne by a Fokker, which fired over a thousand shots at him. In spite of this hail of bullets, and the fact that his machine was riddled, the pilot succeeded in getting back to his lines pursued by his assailant. The Fokker was then attacked at a range of about 30 yards by a French machine, which had come up at full speed, and was brought down near Bourgogne, to the west of Rheims. On the left bank of the Meuse our motor anti-aircraft guns brought down two German machines, which fell, the first to the north of Avocourt, and the second near Forges.

June 1—Bombs on Supply Centre—Last night (May 31) one of our air squadrons dropped about 20 bombs on the stations of Thionville and Audun-le-Roman and 50 bombs on the supply centre at Azannes.

June 1—Bombs on Bar-le-Duc—A group of German aeroplanes this afternoon (June 1) dropped several bombs on the open town of Bar-le-Duc. Eighteen civilians were killed, including two women and four children, and 25 were injured, including six women and 11 children. An Aviatik, attacked by one of our machines, was forced to land in our lines to the south of Bernécourt, in the region of Toul. Both aviators were made prisoners.

June 2—Two German Machines Brought Down—Yesterday (June 1) our squadrons gave battle to a number of aeroplanes which had bombarded Bar-le-Duc and scattered a second squadron. A German aeroplane was brought down near Etain. In the course of the pursuit a Fokker attacked by two of our machines was brought down near Bouconville.

June 4—Raid on Toul—About noon to-day (June 4) a group of German aeroplanes dropped several bombs on Toul. Six persons were killed and ten were injured. The material damage was unimportant. No military establishment was hit. The Toul chasing squadron, having taken the air immediately, vigorously pursued the enemy machines. One of the latter was brought down in our lines at Sanzey, about seven miles north of Toul. Two other enemy aeroplanes, as the result of the machine-gun fire from our aeroplanes, descended suddenly in the German lines.

RUSSIA

May 29—Electric Station Bombarded—Our air squadron bombarded the enemy electric station at the town of Komay, north-west of Lake Narotch.

May 30—Bombs dropped East of Vilna—Enemy aviators dropped some bombs on the railway station of Vileika (east of Vilna) and the small town of Voyston, north-west of it.

May 31—Albatros Brought Down—On the whole front aerial reconnaissance were carried out by the enemy with great persistence. One of our aeroplanes engaged an enemy Albatros which was flying over the enemy's lines. Our machine bombarded the Albatros with machine-gun fire and the enemy machine fell enveloped in smoke north-west of the town of Baranovitchi.

June 1—Effective Air Raids—Two of our aerial squadrons carried out raids on positions at the rear of the enemy's lines. One of these squadrons, comprising six machines, bombarded the region near the town of Soly, north-west of Smorgon, while another, composed of 14 machines, threw bombs on the railway station at Manevitche, on the Sarny-Kowel railway. In the first case 48 bombs were dropped and in the other 66, causing outbreaks of fire. Notwithstanding a very hot

fire from the enemy's artillery, to which they were exposed, all the aviators returned uninjured to their base with their machines.

June 1—Submarine Attacked by Seaplane—The submarine was attacked without success by an enemy seaplane. (This refers to a reconnoitring expedition by a Russian submarine in the Black Sea.)

June 2—Bombs on Station—An enemy aeroplane dropped six bombs on the station of Budslave, north-east of Vileyka.

ITALY

June 1—Bombs on Enemy Camps—On Tuesday and Wednesday (May 30 and 31) squadrons of Caproni aeroplanes raided the Assa valley and dropped bombs on enemy camps and depots with visibly good effect. Our machines returned safely.

June 3—Bombs on Enemy Parks—Enemy aircraft dropped bombs on Ala, Verona, Vicenza, and Schio. The damage was very slight and six persons were injured in Verona. Our squadrons of "Caproni" and Farman machines dropped some hundred bombs on the enemy parks and encampments at the bottom of the Astico valley with clearly excellent results, and returned in safety.

EGYPT

May 30—Bombs on Fleeing Turks—War Office statement: On the morning following the battle (May 23) our aeroplanes threw bombs on a large body of men fleeing from Fasher with Ali Dinar. The latter, when last seen, had a following of only 300 persons and was faced by a journey of one and a half days across waterless desert before he could reach Gebel Marra. (The battle referred to is that waged with the Sultan of Darfur.)

June 1—Turks Pursued by Aeroplanes—War Office statement: At 8 a.m. (on May 31) our aeroplanes took over the pursuit from the mounted troops and bombed the flying enemy, inflicting further casualties.

WEST AFRICA

June —Aeroplanes in W. Africa—The following passage occurs in Maj.-Gen. Sir C. Dobell's dispatch on the conquest of the Cameroon: This (the force under Colonel Gorges) fought its way to Nkongsamba (railhead) by December 10. Two aeroplanes were taken there, the first that had ever arrived in West Africa.

MESOPOTAMIA

May 30—Reports by Aeroplanes—The following references to reports by aviators to General Townshend during the advance on Baghdad occur in the official papers now published:

No. 6.

Viceroy to Secretary of State for India, April 9, 1916. (Telegraphic.) From the General Officer Commanding Force "D":

"3rd October, 1915, to Major-General, General Staff, Kut. By aviator's report you will see he had just left for Kut, and that the chance of breaking up the retreating Turkish forces, which have by now taken up a position at Suliman Pak no longer exists; that position is astride the Baghdad Road and the Tigris, and is estimated to be 6 miles of entrenchments. It is also probable that Baghdad has sent them reinforcements. See report by aviator which gives 6 barges, 3 more steamers, 1 mahela, 105 bell tents, etc., also many men and many stores, etc.; another steamer 5 miles west of Suliman Pak."

No. 7.

General Sir John Nixon, K.C.B., to India Office, April 11, 1916: "From Kut I sent the Major-General, General Staff, by aeroplane to see General Townshend and discuss personally with him the plans submitted."

TURKEY

May 31—Bombs on Smyrna and El Arish—On May 29 some hostile aeroplanes dropped 30 bombs on some quarters of the town of Smyrna, killing and wounding several persons and damaging some houses. On May 27 a hostile torpedo-boat and hostile aeroplanes attacked El Arish. Some bombs were dropped, wounding seven persons. Two of our aeroplanes attacked the warship and the enemy aeroplanes off El Arish. Our aeroplanes effectively dropped bombs and made good use of their machine-guns.

AUSTRIA

May 31—Bombs on Military Works—Early to-day (May 31) several of our seaplanes dropped numerous bombs on railway stations and military works at San Giorgio di Nogaro. Four hits were observed at the station.

GERMANY

May 29—Raid on Aerodrome—German aeroplanes successfully dropped bombs on the aerodrome of Furnes, in Belgium.

May 30—English Biplane Brought Down—Last night (May 29) our aviators attacked with good results an enemy destroyer squadron before Ostend. One English biplane crashed to earth after an aerial battle near St. Eloi, and was destroyed by our artillery fire.

June 1—British Biplane Shot Down—West of Cambrai a British biplane was shot down in an air fight. The occupants—officers—were wounded and captured.

(See English Official)

June 1—Denial of French Claim—The French afternoon *communiqué* of May 29 asserts that, on May 28, five German aeroplanes were destroyed by French airmen and anti-aircraft guns. For a long time past we have not concerned ourselves with correcting the enemy's dispatches, but in this case, which affects the Air Service, a young arm, we declare that neither on the day mentioned nor for a week previously was any German aeroplane lost owing to hostile action.

(See French Official)

June 2—Five Enemy Machines Brought Down—South-west of Lille an undamaged British aeroplane, with its occupants, fell into our hands. In an air fight a French monoplane was brought down over the Marre Ridge and within our lines, one biplane over Vaux, and another west of Moerchingen. A British biplane brought down yesterday is the fourth machine put *hors de combat* by Lieutenant Mulzer.

Russian Aeroplane Destroyed—South-east of Driswiaty Lake a Russian aeroplane was destroyed by our anti-aircraft fire.

June 3—French Biplane Shot Down—Our field artillery shot down a Farman biplane over Vaux. The French biplane mentioned in yesterday's (June 2) report as being shot down west of Mörchingen (Morhange) is the fourth victim of Lieutenant Hohendorf.

June 4—British Aeroplane Shot Down—In Belgium several civilians were killed by bombs dropped by enemy aviators. There was no military damage. Near Hollebeke (south of Ypres) a British aeroplane was shot down by our anti-aircraft guns.

(See English Official)

FROM OTHER SOURCES

FRANCE

May 20—German Pilot Captured—The well-known Hun pilot, Count von Lichtenberger, who has been accorded many of the highest German and Bavarian decorations, and was attached to the Metz aviation centre, has been captured by the French.

May 25—Activity of French Aviators—The following extract is from a recent article by Mr. H. Warner Allen incorporating the replies given by a German officer captured in the Caillette Wood. He complained of the activity of the French aviators. One morning a few men were tempted out of their trenches by the fine weather, and that was enough to betray the position of their trench to the French aerial observers. The result was that that afternoon the German trench was subjected to a terrible bombardment by the 75's.

May 26—Fokker Brought Down—Lieutenant William Thaw, of the American Flying Squadron, has brought down a Fokker in an aeroplane fight on the French front.

May 28—Escape of Gilbert—Eugene Gilbert, the popular French aviator, has a third time escaped. Gilbert was obliged to land on Swiss territory after a successful air raid on the Zeppelin works at Friedrichshafen, and was interned on parole. Last August he escaped into France, but was obliged to return to captivity owing to the fact that the letter in which he notified the Swiss military authorities that he would take back his parole was received after he had made his escape. His second attempt to regain liberty was made last February; when with a fellow prisoner Gilbert got as far as Olten, where the fugitives were discovered by gendarmes and sent back to custody. Since then Gilbert has been watched strictly day and night, as he was no longer considered a prisoner on parole. Gilbert's escape from the barracks in Zurich, where he was last interned, was made in the small hours of the morning by sliding down through a ventilator and gaining the courtyard. The journey to France was accomplished in a friend's motor, which was awaiting the fugitive. The exact whereabouts of Gilbert are not known, but he is generally supposed to be lying low in a suburban refuge prepared in advance, where his wife has gone to join him. Meanwhile Swiss sentinels are looking for him along the frontiers.

June 2—Gilbert on French Territory—The Paris correspondent of the *Morning Post* states: that Gilbert has reached French territory. Gilbert was for some days at large in Switzerland, and eventually by a trick succeeded in getting across the frontier. He was expected in Paris yesterday.

RUSSIA

June 2—Aircraft Activity—The special correspondent of the *Morning Post*, writing from Petrograd, states: Aerial activity is becoming a most strongly marked feature of the present stage of the conflict on Russia's European front. Whether this indicates the incubation of large strategic plans on one side or the other, it is impossible to say. The Russians are evidently growing very strong in the air. Their aeroplanes now fly in squadrons or flotillas, acting together like small craft at sea under a single command.

ITALY

May 31—Enemy Seaplane Wrecked—An enemy seaplane was brought down in the Lower Adriatic yesterday morning (May 30).

BALKANS

May 28—Bombs on Gallipoli—A squadron of British aeroplanes dropped bombs on the fortified works of Gallipoli, causing heavy damage.

May 31—Zeppelin Reported Wrecked—Near Kuprulu (on the Vardar), a Zeppelin came into contact with trees when descending and was destroyed.

[It was at the mouth of the Vardar, near Salonika, that the "L85" was recently brought down.]

June 3—Bombs on Enemy Camps—French aircraft bombed enemy camps in the region of Lake Doiran this morning (June 3).

ROUMANIA

May 29—Roumanian Pilot Killed—Advices from Bukarest state that the pilot, Captain Compincaco, was killed in an aeroplane accident at the Pipera aerodrome.

AUSTRIA

May 28—Army Pilot Killed—At the Czegadin aerodrome the pilot, Sub-Lieut. J. Schwartz, fell while testing a new aeroplane and was killed on the spot.

GERMANY

May 30—The Supply of Zeppelins—The following passage relative to Germany's supply of Zeppelins occurred in a letter by a neutral recently published in *The Times*: "That there are plenty of Zeppelins and Parsevals can be gathered from the number that fly over Berlin each fine day. They are so numerous that the public no longer take any notice of them. I have heard it whispered that since the beginning of the war 47 Zeppelins have been lost, 'chiefly by accident.' I have also heard it said that the new Zeppelins cost £125,000 each."

May 30—New Zeppelin—A telegram from Zurich to the *Petit Journal* states that Swiss spectators observed yesterday (May 29) over Lake Constance a new Zeppelin, the dimensions of which exceed those of the airships previously constructed. It is about 800 feet long, and has four armoured cars and seven propellers.

May 30—German Aeroplanes Burnt—A newspaper report says that some sheds near Dresden Neustadt, containing 24 aeroplanes belonging to the military flying school, have been burned down. All the machines were destroyed.

May 31—Aerodrome near Liege—According to the *Echo Belge* the Germans have established an aerodrome on the plateau of Ans, near Liège.

June 1—Crippled Zeppelin—It is reported from Sonderho, in the Island of Fanoe, that the Zeppelin L24 passed there at 11.30 this morning (June 1), going south-west. She was apparently badly damaged. According to the *Ribe Stiftstidende* people at Sönderho observed the L24 flying in a southerly direction close to land, and very low. The airship was evidently in distress, and completely at the mercy of the wind. The steering gear was failing, and volumes of smoke were issuing from the motor. The envelope at times was sloping at an angle of 45 degrees. When rounding the southernmost point of Fanoe the airship, over which the crew plainly had no control, drifted over some Danish villages, and finally passed over the village of Hom into German territory.

June 2—Danes Fire on Zeppelin—The *Politiken* states that when a Zeppelin was passing Fanoe Island sentries fired a large number of shots against the airship, which withdrew over international territory. This is the first time that a Danish shot has been fired against a belligerent airship.

June 3—Airships' Work in North Sea Action—In spite of the unfavourable atmosphere naval airships and aviators materially contributed to the success of our Naval forces by reconnoitring and reporting.

June 3—Zeppelin Scouts—Stories of the naval action in the North Sea on May 31 from various quarters indicate that Zeppelins played a very important part in the battle.

In a *Times* Copenhagen message it is stated that ten warships sighted on Wednesday morning (May 31) by fishermen from Thyborön, when about forty-five miles out at sea, were accompanied by two Zeppelins. In the afternoon, off the Skaw, the steamer *N. J. Fjord* met two Zeppelins hurrying westward.

About midnight a Zeppelin passed over the west coast of Jutland going from north to south, and at six on Thursday morning (June 1) a Zeppelin and an aeroplane were sighted at Fanö. Towards midday the L24 passed Sönderho towards Hviding, flying low and apparently damaged.

That this airship did not escape without damage is borne out by the *Daily Mail's* Copenhagen correspondent, who states that the Zeppelin L24, which with five other Zeppelins and several seaplanes took part in the battle, was hit several times forward and much gas was lost. L24 was able only to get home with her crew, of whom many were wounded. All her supplies were thrown overboard, and after a narrow escape she reached the Schleswig coast.

June 3—Reported Loss of Two Zeppelins—Trawlers which have come back to Ringköbing bring details of the destruction of a Zeppelin, which is also reported by fishermen from Thyborön. Two Zeppelins were seen flying low and slowly southwards. One suddenly came down 45 miles off Holmslands Klit, and later there was an explosion and a fire, and a cloud of smoke spread over the sea. The other Zeppelin which managed to leave the scene of the action foundered in flight. The damaged L24, having reached the mainland at Ribe, strayed about, apparently having lost its way. It flew very low, nearly colliding with a chimney at Hjartslund and frightening the cattle in the fields. It passed the frontier at Hömlund, the German soldiers waving handkerchiefs. Yesterday (June 2) two Zeppelins and three seaplanes were sighted reconnoitring off Blaavandshuk.

June 4—No German Airships Lost—With reference to statements that have appeared in foreign newspapers, a Berlin telegram asserts that no German airships were lost during the recent naval battle.

June 4—Zeppelin Damaged in North Sea Battle—The following statement dealing with the work of Zeppelins in the North Sea battle was made by a naval officer to a representative of the Associated Press of America and passed by the Press Bureau:—

The Zeppelins did not play the part which was attributed to them. Only one appeared and remained in action a very brief time, retiring under heavy fire evidently badly damaged. The weather conditions were such that it is doubtful whether any aircraft would have been of much service.

HONOURS FOR THE AIR SERVICES

DISTINGUISHED SERVICE CROSS

Flight Sub-Lieut. Henry Karslake Thorold, R.N.A.S.
Sub-Lieut. Reginald Henry Portal, R.N.

For conspicuous gallantry during a combat with an enemy aeroplane in the Dardanelles. At the outset Flight Sub-Lieutenant Thorold, the pilot, was severely wounded in the back, and Sub-Lieut. Portal, the observer, in the thigh and arm. The pilot momentarily lost control and the machine nose dived, but he soon regained control and the observer succeeded in firing another two magazines, whereupon the enemy machine sheered off and disappeared. The pilot took his machine safely back to the aerodrome, a distance of about 25 miles, and, after making a perfect landing, lost consciousness.

DISTINGUISHED SERVICE MEDAL

Chief Petty Officer Mechanic, R.N.A.S., Bernard John Wm. Brady, O.N. 234186.
P.O. Mechanic, R.N.A.S., L. T. Sanderson.

MENTIONED IN DESPATCHES

The following petty officers and men have been mentioned in despatches by the Vice-Admiral Commanding the Eastern Mediterranean Squadron for good services in action between the time of landing in the Gallipoli Peninsula in April, 1915, and the evacuation in December, 1915-January, 1916:—

Chief Petty Officer, R.N.A.S., Herbert Bradford, O.N. M204.
Petty Officer, R.N.A.S., Cyril Brewie, O.N. 13987.
Chief Petty Officer, R.N.A.S., Albert Herbert Cummings, O.N. F667.
Petty Officer Mechanic, R.N.A.S., Arthur Ernest Close, O.N. 234743.
Chief Petty Officer, R.N.A.S., Edmond Dessaussois, O.N. F1663.
Chief Petty Officer, 2nd Grade, R.N.A.S., John Evason, O.N. 200966.
Chief Petty Officer, R.N.A.S., Hugh John Hughes, O.N. F892.
Petty Officer, R.N.A.S., Arthur Percy James, O.N. F174.
Petty Officer, R.N.A.S., Alexander Jack, O.N. F677.
Petty Officer, R.N.A.S., Frederick Kerchey, O.N. F700.
Chief Petty Officer, R.N.A.S., George Lacey, O.N. 272252.
Chief Petty Officer, R.N.A.S., Hubert Poyntz Leigh, O.N. M947.
Chief Petty Officer, R.N.A.S., Harry Nelson, O.N. F8945.
Chief Petty Officer, R.N.A.S., Percy Randolph Pratt, O.N. 344680.
Chief Petty Officer, R.N.A.S., Edward John Prothero, O.N. F676.
Petty Officer Mechanic, R.N.A.S., Albert Edwin Platford, O.N. R.M.A. 11363.
Chief Petty Officer, R.N.A.S., David Morris Rees, O.N. 344437.
Chief Petty Officer, R.N.A.S., Charles Snow, O.N. 347686.
Chief Petty Officer, R.N.A.S., John Sutherland, O.N. 272328.
Petty Officer Mechanic, R.N.A.S., Thomas James Edward Thornton, O.N. J5756.

FOREIGN DECORATIONS FOR R.N.A.S.

The King has granted authority for the wearing of the following decorations conferred by the President of the French Republic:—

INSIGNIA OF CHEVALIER OF THE LEGION OF HONOUR

Engineer Lieutenant-Commander Edward Featherstone Briggs, D.S.O., R.N. ((Squadron Commander, R.N.A.S.).
Lieutenant John Tremayne Babington, D.S.O., R.N. (Squadron Commander, R.N.A.S.).
Flight Commander Sidney Vincent Sippe, D.S.O., R.N.A.S.

HONOURS FOR THE R.F.C.

The *London Gazette* of May 16 contained the following awards:—

MILITARY CROSS

Second Lieutenant Alfred de Bath Brandon, Royal Flying Corps (Special Reserve).

For conspicuous gallantry and skill in dropping bombs on a Zeppelin at night.

Second Lieutenant (Temporary Captain) Hugh Vivian Champion de Crespigny, Suffolk Regt. and Royal Flying Corps.

For conspicuous gallantry and skill, notably when he attacked five enemy machines over the enemy's lines. He drove away one and brought another to the ground badly hit. His own machine was then crippled by the fire of the remaining three, but after emptying one more drum at them he brought his machine down safely in our lines.

Second Lieutenant William John Charles Kennedy-Cochran-Patrick, Rifle Brigade and Royal Flying Corps.

For conspicuous skill and determination. He climbed and attacked an enemy machine at 14,000 ft., and, although he failed in his first and second attacks, he went for it again a third time, shot both pilot and observer and brought it down. He followed it down and landed alongside.

Second Lieutenant Claude Alward Ridley, Royal Fusiliers and Royal Flying Corps.

For conspicuous gallantry and good work during Zeppelin raids.

ALBERT MEDAL OF THE FIRST CLASS

Major Cyril Louis Norton Newall, 2nd Gurkha Rifles (attached to the Royal Flying Corps).

ALBERT MEDAL OF THE SECOND CLASS

Corporal Henry Hearne, Royal Flying Corps.

First Class Air Mechanic Harrie Stephen Harwood, Royal Flying Corps.

Second Class Air Mechanic Alfred Edward Simms, Royal Flying Corps.

On January 3, 1916, at about 3 p.m., a fire broke out inside a large bomb store belonging to the Royal Flying Corps, which contained nearly 2,000 high-explosive bombs, some of which had very large charges, and a number of incendiary bombs which were burning freely. Major Newall at once took all necessary precautions, and then, assisted by Air Mechanic Simms, poured water into the shed through a hole made by the flames. He sent for the key of the store, and with Corporal Hearne, Harwood and Simms entered the building and succeeded in putting out the flames. The wooden cases containing the bombs were burnt, and some of them were charred to a cinder.

The *London Gazette* of May 31 contained the following awards:

MILITARY CROSS

Capt. John Burgh Talbot Leighton, Scots Guards, attached No. 14 Squadron, R.F.C.

For conspicuous gallantry and skill. He took photographs at a height of 200 ft. while his observer engaged the enemy with rifle fire. On other occasions he has done fine and gallant work.

Temp. Lieut. Franklyn Bellamy, General List, attached No. 17 Squadron, R.F.C.

For conspicuous gallantry and skill. When unable to reconnoitre owing to clouds, he descended to 200 ft. under heavy fire. Though his instruments were broken and his petrol tank pierced, he eventually returned safely. On another occasion, when forced to descend, he repaired his engine under sniping fire, carried out his bombing, and again returned safely.

Temp. Lieut. John Gwynne Howell, R.F.A., attached No. 16 Squadron, 2nd Wing, R.F.C.

For conspicuous gallantry and skill. When the pilot of his machine was killed he climbed into the pilot's seat, and, standing in front of him, managed to land the machine within our lines.

Lieut. Frederick Frank Minchin, Princess Patricia's Canadian Light Infantry, attached R.F.C.

For conspicuous gallantry and skill on many occasions, notably when leading a successful bomb and machine-gun raid on a force of the enemy which he had located overnight. Next day he took part in two other raids. During these operations he flew for 13 hours over enemy country.

Lieut. (Temp. Capt.) Arthur Ashford Benjamin Thomson, Royal Warwickshire Regt. and R.F.C.

For conspicuous gallantry and good work during Zeppelin raids.

Second Lieut. Sydney Edward Cowan, R.F.C., Special Reserve.

For conspicuous gallantry and skill. He dived on to an enemy machine in the enemy's lines and drove it to the ground, where it was smashed, and then circled round and fired at the pilot and observer as they ran for shelter. Although forced to land through his engine stopping he contrived to restart it and got back under heavy fire.

Second Lieut. Francis Douglas Stuart-Gray, Lord Doune, Scottish Horse, T.F., and R.F.C.

For conspicuous gallantry and skill. When on patrol duty with Second Lieutenant Walker he sighted a Fokker machine 1,000 ft. below them. Second Lieutenant Lord Doune at once dived, and, when within 60 yards, Second Lieutenant Walker opened fire. Lord Doune then headed straight for the Fokker, which had to rise steeply to avoid a collision. Second Lieutenants Walker and Lord Doune then both opened fire and shot away one wing of the Fokker, which fell behind our lines.

Second Lieut. Valentine Alexander Stookes, 2nd Dragoons, Special Reserve, attached No. 14 Squadron, R.F.C.

For conspicuous gallantry and skill. He engaged the enemy with rifle fire and shot two while his pilot was photographing at 200 ft. altitude. On other occasions he has done fine work.

Second Lieut. David Mary Tidmarsh, 4th Royal Irish Rifles, Special Reserve, and R.F.C.

For conspicuous gallantry and skill when attacking hostile aircraft on several occasions, notably on one occasion when he dived at an enemy machine and drove it down wrecked to the ground.

Temp. Second Lieut. Robert Verschoyle Walker, 6th Connaught Rangers and R.F.C.

For conspicuous gallantry and skill. When on patrol duty with Second Lieutenant Lord Doune he sighted a Fokker machine 1,000 ft. below them. Second Lieutenant Lord Doune at once dived, and, when within 60 yds., Second Lieutenant Walker opened fire. Lord Doune then headed straight for the Fokker,

which had to rise steeply to avoid a collision. Second Lieutenants Walker and Lord Doune then both opened fire and shot away one wing of the Fokker, which fell behind our lines.

DISTINGUISHED CONDUCT MEDAL

- 211 Flight Serg. (Acting Serg.-Maj.) C. A. C. Fidler, "X" Aircraft Park, R.F.C.
 212 Flight Serg. (Acting Serg.-Maj.) R. J. Sladden, No. 17 Squadron, R.F.C.
 22 Flight Serg. (Acting Serg.-Maj.) W. G. Stafford, No. 14 Squadron, R.F.C.

C.M.G.

The *London Gazette* of June 3 announced the following:—

THE MOST DISTINGUISHED ORDER OF ST. MICHAEL AND ST. GEORGE FOR VALUABLE SERVICES RENDERED IN CONNECTION WITH THE WAR.

To be Additional Member of the Third Class, or Companion of the said Most Distinguished Order:

Major (Temp. Lieut.-Col.) L. E. O. Charlton, D.S.O., Lancashire Fusiliers and R.F.C.

PROMOTIONS

Promotions for valuable services in connection with the war:

TO BE BREVET LIEUTENANT-COLONELS

- Major (Temp. Lieut.-Col.) W. W. Warner, R.F.C., late Indian Army (on retired list).
 Major (Temp. Lieut.-Col.) H. R. M. Brooke-Popham, D.S.O., Oxford and Bucks Light Infantry and R.F.C.
 Major (Temp. Brig.-Gen.) J. M. Salmond, D.S.O., Royal Lancashire Regt., and R.F.C.
 Major (Temp. Lieut.-Col.) W. G. H. Salmond, R.A. and R.F.C.

DISTINGUISHED SERVICE ORDER

- Capt. and Brevet Major S. D. Massy, R.F.C., Indian Army.
 Capt. and Brevet Major A. J. Ross, R.E. and R.F.C.

MILITARY CROSS

- Capt. G. W. D. Allen, Liverpool Regt., Special Reserve, and R.F.C.
 Capt. (Temp. Major) A. C. Bolton, Royal Scots Fusiliers and R.F.C.
 Capt. M. G. Christie, R.F.C., Special Reserve.
 Lieut. (Temp. Capt.) J. P. C. Cooper, R.F.C., Special Reserve.
 Second Lieut. F. E. Goodrich, R.F.C., Special Reserve.
 Second Lieut. (Temp. Capt.) J. H. Herring, R.F.C., Special Reserve.
 Capt. (Temp. Major) T. O'B. Hubbard, R.F.C., Special Reserve.

FRENCH AVIATOR'S EXPLOIT

Only bare announcements have been made in the official *communiqués* of two recent brilliant aviation exploits, the first being the bombardment of a Zeppelin over the North Sea by a French aeroplane, and the second the bombardment from the air of a German cruiser in the same locality, the same aviator being engaged in both enterprises. The hero of these exploits is Sergeant Treille de Grandseigne. His attempt on the Zeppelin was made during the night of April 25-26, when alone, and at a distance of 12 miles from Zeebrugge, he attacked the monster and hit it several times. Some details of this adventure have already been published, but it has only now been made known that he was able to drop 16 shells on the airship and to effect damage that seemed to him to be considerable. The sergeant, who is 25 years of age, has the Military Medal and Croix de Guerre. After the war began he effected two brilliant raids, and in September, 1915, was mentioned in Army Orders, with his observer, for a long fight with an armoured German aeroplane, which he brought down. He was then attached to a squadron of armed aeroplanes, and in one of these craft in January of this year he brought down a Fokker after a long and exciting battle with several enemy planes. Shortly after he flew over the sea with the object of attacking enemy vessels. As it was dark he kept at a height of only 900 ft., and soon he was in sight of Ostend. Picked up from the town by a searchlight, he made straight for it, and his companion succeeded in extinguishing it.

The sergeant holds the record for being the first aviator mounted in an aeroplane as distinct from a hydroplane to attack a vessel at sea. He left on the night of April 15-16 and passed over Nieuport and Middelkirke, being violently bombarded during the journey by the Germans. He was flying at a height of scarcely 1,500 ft. On this occasion the Ostend searchlight was prudently extinguished. When four miles north-east of the town, and three miles from the coast, he saw two red lights approaching the harbour. By means of his own searchlight and when 300 ft. above the lights he was able to see that they were on two German vessels. Both craft fired at him and one shell burst close to his aeroplane. He put out all his lights, and in the darkness his companion fired 16 shells at the enemy vessels, several of which struck one of them, a cruiser, seriously damaging her.—*The Morning Post*.

AEROPLANE FROM LEICESTER

Leicester has the honour of being the first town to respond to the appeal of the Imperial Air Fleet Committee that local centres of industry should by public subscription raise funds to provide aeroplanes for the use of the Oversea Forces. Sir George

- Capt. L. Jenkins, R.G.A. (T.F.) and R.F.C.
 Lieut. (Temp. Capt.) L. W. Learmount, R.F.C., Special Reserve.
 Lieut. (Temp. Capt.) B. C. McEwen, R.F.C., Special Reserve.
 Capt. A. G. Moore, Special Reserve, Manchester Regt., attached R.F.C.
 Capt. (Temp. Lieut.-Col.) C. F. de S. Murphy, Royal Berkshire Regt. and R.F.C.
 Lieut. (Temp. Capt.) L. A. Pattinson, Royal Fusiliers and R.F.C.
 Capt. (Temp. Major) T. V. Smith, R.F.C., Special Reserve.
 Second Lieut. W. V. Strugnell, Hampshire Regt. and R.F.C.
 Lieut. (Temp. Capt.) H. A. Van Ryneveld, R.F.C.
 Capt. Lord G. Wellesley, Grenadier Guards and R.F.C.
 Second Lieut. (Temp. Capt.) W. G. B. Williams, R.F.C., Special Reserve.

DISTINGUISHED CONDUCT MEDAL

- 1675 Flight Serg. H. G. Dudley, R.F.C.
 68403 Serg. W. J. Fordham, R.H.A. (attd. 14th Anti-Aircraft Section).
 88053 Gunner G. W. G. Marshall, R.H.A. (attd. 14th Anti-Aircraft Section).
 1776 Flight Serg. (Acting Serg.-Maj.) H. McKenna, R.F.C.
 8358 Serg. E. Trowbridge, R.H.A. (attd. 20th Anti-Aircraft Battery).

MILITARY MEDAL

- 299 Flight Serg. (Acting Serg.-Maj.) T. Bell, R.F.C.
 1857 Serg. S. Bull, R.F.C.
 116 Flight Serg. (Acting Serg.-Maj.) H. C. S. Bullock, R.F.C.
 39677 Serg. G. W. F. H. Downer, R.H.A. (attd. 14th Anti-Aircraft Section).
 7911 Second Class Air Mechanic H. N. Farmer, R.F.C.
 7500 Second Class Air Mechanic A. J. Greatorex, R.F.C.
 320 Flight Serg. (Acting Serg.-Maj.) H. James, R.F.C.
 54 Flight Serg. (Acting Serg.-Maj.) J. C. Jones, R.F.C.
 346 Flight Serg. (Acting Serg.-Maj.) M. Keegan, R.F.C.
 422 Flight Serg. (Acting Serg.-Maj.) C. Littlejohn, R.F.C.

OTHER HONOURS

TO BE BREVET LIEUT.-COL.

Major (Temp. Lieut.-Col.) E. M. Maitland, Essex Regt.

TO BE BREVET MAJOR

Capt. (Temp. Lieut.-Col.) R. K. Bagnall-Wild, late R.E. (on retired list).

DISTINGUISHED SERVICE ORDER

Major W. A. de C. King, R.E.

Perley, High Commissioner for Canada, at Leicester, on June 3, formally received the aeroplane "Leicester" on behalf of the Dominion Government.



ACTIVITY AT THE HALL SCHOOL

CASUALTIES

ROYAL NAVAL AIR SERVICE

DROWNED

Besson, Flight Sub-Lieut. Frank, R.N.

Flight Sub-Lieut. Frank Besson, R.N., has been missing since December 20, 1915, on which day, his observer now reports, he was drowned. He was 20 years of age. He entered the Royal Naval Air Service on December 21, 1914, and saw active service at Dunkirk and the Dardanelles, where he lost his life. He was educated at Westminster, where he was a sergeant in the O.T.C. In 1914 he won the Public Schools mile race at Stamford Bridge. He had taken a keen interest in aviation since the age of 12, and exhibited a model aeroplane in the Aeronautical Exhibition of 1909.

(The death of Lieut. Besson was reported in our issue of May 17.)

ACCIDENTALLY INJURED

May 21

Forgan-Potts, Flight Lieut. John, R.N.

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED

April 29

Terraneau, Flight Sub-Lieut. Cecil R., R.N.

ROYAL FLYING CORPS

KILLED

Undated

Amor, Lieut. E. J., Middlesex Regt. and R.F.C.

Jones, Lieut. T., Canadian A.S.C., attached R.F.C.

Catton, 3994 First Class Air Mech. S., R.F.C.

Tillie, Capt. Arnold Reed, Cameronians, attached R.F.C.

Capt. Arnold Reed Tillie, Cameronians, attached Royal Flying Corps, who fell on May 11, aged 22 years, was the second son of William J. Tillie, of Londonderry, and grandson of the late William Tillie, of Duncreggan House, Co. Londonderry.

Barrett, Capt. E. W., R.F.C.

May 29

Sheffield, Second Lieut. E. F., R.F.C.

Second Lieut. Edward Frederick Sheffield, R.F.C., who was killed in a parachute descent while on active service, was the only son of the late Mr. F. Sheffield, of Finsbury Park, and of Mrs. H. K. Knowles, of Muswell Hill, N., and was 20 years of age.

Barrett, Capt. E., R.F.C.

Captain Ernest Barrett, Royal Flying Corps, killed in action, was the second son of Mr. James Barrett, of Seaview, Farnham Road, Bangor, Co. Down. He was educated at Campbell College, Belfast, Armagh Royal School, and Queen's University, Belfast, and subsequently emigrated to Australia. Later he proceeded to Singapore, where he was assistant manager of a rubber plantation. He returned home last year to join the forces, and his promotion to the rank of captain was announced last week.

UNOFFICIALLY REPORTED KILLED

May 18

Selwyn, Lieut. A. P., Indian Army and R.F.C.

Lieut. Arthur Penrose Selwyn, Indian Army Reserve of Officers and Royal Flying Corps, killed while flying on May 18, was the third son of the Rev. Dr. Selwyn, of Undershaw, Hindhead, and formerly Headmaster of Uppingham School. He was born in August, 1889, and educated at Uppingham, where he was a sergeant in the O.T.C. In 1910 he became a tea-planter in India, and while there joined the Assam Valley Light Horse. On the outbreak of war he received a commission in one of the Cavalry regiments, and in 1915 he served in France with the Indian Division. In July he was attached to the Royal Flying Corps as an observer, and was present at the battle of Loos. After assisting in hospital work he was invalided home. In January of this year he began his training in England as a pilot in the R.F.C., and on May 16 he received his wings at the C.F.S., Upavon.

Basden, Second Lieut. M. D., London Regt., attached R.F.C.

Second Lieut. Maurice Duncan Basden, London Regt., attached Royal Flying Corps, who met his death in a fight in the air, aged 21 years, was the younger son of Mr. and Mrs. Duncan F. Basden, of 26, Thurlow Road, Hampstead, N.W.

Grune, Lieut. G. D., R.F.A., attached R.F.C.

Lieut. Gilbert Dennis Grune, R.F.A., attached Royal Flying Corps, news of whose death has been received through the British Red Cross Society from Geneva, was educated at South Lodge, Lowestoft, and Steyning Grammar School. For three years he was a pupil with Messrs. Vickers at Erith, and had just completed his pupilage and passed his inter-B.Sc. at London University, when his battery was mobilised at the outbreak of war. He went to France with the battery in November, 1914, and was present in several engagements. In 1915 he was transferred to the Royal Flying Corps, and took his wings on September 2 of that year, being posted to a squadron in the following November. He served as a pilot and was killed on March 13 while on reconnaissance. He was the son of Dr. Edward Grune, temporary captain, R.A.M.C., of The Hall, Southwick, Sussex.

DIED OF WOUNDS

Lucas, Capt. G. B., Indian Cavalry, attached R.F.C.

Capt. Gerald Blunt Lucas, Indian Cavalry, attached Royal Flying Corps, who died of wounds received in action on May 16, was the youngest son of the late Lieut.-Col. C. A. de N. Lucas, Indian Army, and of Mrs. Vyvyan Williams, of Teignmouth, Devon. Born in August, 1890, he was educated at Haileybury, and passed out of Sandhurst to the Unattached List for the Indian Army in January, 1910. In the following year he was gazetted to the Indian Army; promotion came to him in April, 1912, and he was gazetted captain this year.

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED

Undated

Bruno, Capt. C., R.F.C.

Lawrence, Second Lieut. W. G., Oxford and Bucks L.I. and R.F.C.

Marks, Capt. C. H., R.F.C.

Walker, 1941 First Class Air Mech. A.

PREVIOUSLY REPORTED KILLED, NOW REPORTED MISSING, BELIEVED KILLED

Ryckman, Second Lieut. E. G., R.F.C.

PREVIOUSLY REPORTED MISSING, NOW REPORTED MISSING, BELIEVED KILLED

Dennistoun, Lieut. J. R., Canadian Divisional Cyclist Co., attached R.F.C.

MISSING

Grinnell-Milne, Capt. D., Royal Fusiliers and R.F.C.

Mowat, Second Lieut. M. M., R.F.C.

Aked, Lieut. H. L. C., West Yorkshire Regt., attached R.F.C.

James, Capt. C. E. H., Welsh Regt. and R.F.C.

Basden, Second Lieut. M. D., London Regt. and R.F.C.

McMaster, 1840 Corp. B., R.F.C.

PREVIOUSLY REPORTED MISSING, NOW REPORTED WOUNDED AND A PRISONER

Gayford, Second Lieut. D. B., Royal West Surrey Regt. and R.F.C.

WOUNDED

Chaworth-Musters, Second Lieut. R. M., Leicester Regt. and R.F.C.

Findlay, Lieut. A. L., R.F.C.

Forbes, Capt. E. W., Royal Warwickshire Regt., attached R.F.C.

Davidson, Second Lieut. D. A. L., R.F.C.

Milne, Capt. W., R.F.C.

Wright, Second Lieut. F. C. A., R.F.C.

Francis, Second Lieut. A. H., Royal Sussex Regt. and R.F.C.

Batchelor, 5598 Second Class G.B. Air Mechanic.

Mackay, Capt. C., Leinster Regt. and R.F.C.

Slessor, Lieut. J. C., R.F.C.

South African Force

DIED

Cowle, Z/178 Air Mech. J. H., R.F.C.

The following notice appeared in the obituary columns of May 26:—

Le Brasseur—On the 25th inst., at Thorpe, Norwich, as the result of a motoring accident, R. H. H. Le Brasseur, Flying Officer, R.F.C.

FATAL ACCIDENTS

Three fatal aviation accidents occurred at Gosport on May 18. In the first case Lieut. George Simpson Bateman and Lieut. A. R. Selwyn went for a flight in the morning, and the machine, when at a height of about a thousand feet, was seen to be in difficulties. It suddenly nose-dived and fell into a field. The occupants were dead when extricated.

In the afternoon a mechanic, Richard Allen, was on the point of ascending for a flight with Lieut. Brook, when it was seen that a piece of waste had settled on the tail of the propeller. Allen got out of the machine to remove it, when he was struck by the propeller and received injuries from which he died.

A fatal aeroplane accident occurred on May 28 in Kent. A military biplane had descended and was rising for the return journey when it was caught by the wind and side-slipped at a height of 120 ft., falling nose downwards. The observer, Capt. George Alfred Grime Jones, was killed, and the pilot, Second Lieut. Tennant, was seriously injured. At the inquest held on May 31 on the body of Capt. Jones, the jury returned a verdict of "Death by misadventure."

A verdict of "Accidental death" was returned at an inquest on the body of Second Lieut. John Arthur Ruck, R.F.C., son of Mr. Morris A. Ruck, of Weavering Grange, near Maidstone, who was killed while flying on May 25. The machine descended in a field, turned a somersault, and caught fire. Mr. Ruck was thrown clear of the flames and was found lying unconscious near the wreckage. He died a few hours later from fracture at the base of the skull.

Another inquest was held on the body of Second Lieut. Robert Newman, of the Royal Flying Corps, who was killed on May 27 while piloting a biplane. Mr. Robert Newman, of Hampstead, identified the body as that of his eldest son. He was in France about three months, and on one occasion took a machine over in what he considered almost "record" time—an hour and a half. He had had a good deal of experience. Major Vernon Harcourt said that Mr. Newman had been recommended for flight commander. A verdict of "Accidental death" was returned. His passenger, Second Lieut. Bayly Bruyn, died at Cambridge the same evening.

FATAL ACCIDENT TO PUPIL

Albert Charles Mahoney, 30, of Sunningfields Road, Hendon, a pupil at the Aerodrome, was flying on the morning of May 24, before submitting himself for his pilot's certificate, when his machine fell a distance of about 200 ft., and he was killed. When examined the controls of the machine were found to be in perfect order.

FATAL ACCIDENTS AT UPAVON

Lieut. Ernest Davis Le Sauvage, Dorset Regt., aged 19, and Second Air Mech. William John Woodland, aged 28, were killed while flying at the flying school, Upavon, on May 30. Lieut. Le Sauvage, whose home is at Beaumont, Jersey, was attached to the school as an assistant instructor. He was wounded at the front in April, 1915. Verdicts of "Accidental death" were returned at the inquest.

Another accident occurred in the same district on May 31, in which Flight Serg. Enos George West, 22, and Second Air Mech. William Burlinson, 28, were killed. A verdict of "Accidental death" was returned at the inquest.

APPOINTMENTS

ROYAL NAVAL AIR SERVICE

J. L. Pritchard, granted temp. commission as Sub-Lieut. (R.N.V.R.), and appointed to *President*, additional, for R.N.A.S.: June 2.

The following have been entered as Probationary Flight Sub-Lieuts. (temp.):

H. J. Path and F. H. Prime, with seniority of May 1, and appointed to *President*, additional, for R.N.A.S., from same date.

J. E. Potvin and G. R. Halliday, with seniority of April 29, and appointed to *President*, additional, for R.N.A.S.: May 7.

Chief Petty Officer:

C. J. Turner, promoted to Temp. Sub-Lieut. (R.N.V.R.), with seniority of May 28, and appointed to *President II.*, additional, for R.N.A.S.

Temp. commissions as Sub-Lieut. (R.N.V.R.):

Lce-Corp. J. H. Green, 4th Seaforth Highlanders, and N. L. Silvester, and both appointed to the *President*, additional, for R.N.A.S.: June 4 and 5 respectively.

Temp. Sub-Lieut. (R.N.V.R.):

A. C. Wade, to *President*, additional, for R.N.A.S.: May 31.

Temp. Sub-Lieut. (R.N.R.):

F. D. Casey, commission as Temp. Sub-Lieut. (R.N.R.) terminated May 27, and entered as Probationary Flight Sub-Lieut. (temp.), with seniority of May 28, and appointed to *President*, for R.N.A.S.

T. M. Ritchie, granted temp. commission as Lieut. (R.N.V.R.), with seniority of May 31, and appointed to *President*, for R.N.A.S.

ROYAL FLYING CORPS

The following temp. appointments are made at the War Office:
Deputy Assistant Director:

Capt. F. C. Jenkins, R.F.C., S.R., from Squadron Commander, Military Wing, and to relinquish the rank of Temp. Major: March 27

Staff Capts.:

Capt. L. V. S. Blacker, Corps of Guides, I.A., from a Balloon Officer, vice Major B. Hopkinson, Unattached List, T.F.: March 27.

Capt. I. M. Bonham-Carter, Northumberland Fusiliers, from a Flight Commander, in succession to Temp. Capt. G. M. R. A. MacSwiney: April 22.

Temp. Lieut. H. A. P. Disney, Cambridge Rifles, T.F., from an Assistant Equipment Officer, and to be Temp. Capt. whilst so employed, vice Major C. Mellor, R.E.: May 1.

Temp. Hon. Capt. J. S. Nicholson, and to be Temp. Capt. whilst so employed; Temp. Capt. L. Sadler, A.S.C., from an Assistant Equipment Officer: May 8.

Temp. Capt. the Hon. E. E. Charteris: May 8.

Staff Lieuts.:

Lieut. W. W. W. Reilly, Connaught Rangers, and to be seconded, vice Lieut. G. W. Wentworth, Norfolk Regt.: April 19.

Second Lieut. F. L. Mond, R.F.A., T.F., from a Flying Officer; Second Lieut. J. N. Mearns, R.F.C., S.R., from an Assistant Equipment Officer; Temp. Capt. R. A. Coote; Temp. Second Lieut. H. W. Phear, R.A.; Second Lieut. M. O. Darby, R.F.C., S.R., from an Assistant Equipment Officer; Temp. Second Lieut. H. M. Bentley, from an Assistant Equipment Officer; Lieut. (D. O.) C. Mason, R.A.; Capt. C. F. Krabbe, T.F. Reserve: May 8.

Squadron Commander:

Qmr. and Hon. Lieut. (Temp. Capt.) A. Fletcher, from an Equipment Officer, and to be Temp. Major whilst so employed: February 29.

Wing Adjts., and to be Temp. Capts. whilst so employed:

Lieut. C. S. McNab, Cameron Highlanders: April 8.

Second Lieut. B. E. Sutton, Westmoreland and Cumberland Yeomanry, T.F., from a Flying Officer (Observer): May 6.

Lieut. R. H. Jerman, Royal Welsh Fusiliers, and to be seconded, vice Capt. H. M. Meyler, Border Regt.: May 7.

Flight Commanders, from Flying Officers, and to be Temp. Capts. whilst so employed:

Lieut. F. F. Minchin, 7th Canadian Infantry Bn.; Temp. Lieut. W. D. Long, A.S.C., and to be transferred to the General List: May 15.

Flight Commanders, from Flying Officers:

Lieut. F. W. H. Simpson, R.A., and to be Temp. Capt. whilst so employed: May 16.

Lieut. (Temp. Capt.) G. V. Rice, R.A., T.F., and to retain his temp. rank whilst so employed: May 23.

Flight Commanders, from Balloon Officers:

Lieut. G. F. H. Faithfull, 126th Baluchistan Infantry, I.A., and to be Temp. Capt. while so employed; Capt. J. P. Shelley, Royal Lancaster Regt.: May 1.

Flying Officers:

Second Lieut. Temp. Lieut. E. K. Anderson, Highland Light Infantry, T.F.: Temp. Second Lieut. L. G. Paget, Reserve R. of Royal Horse Guards, and to be transferred to General List; Second Lieut. H. V. Pendavis, D.S.O., Oxfordshire and Buckinghamshire Light Infantry, and to be seconded; Second Lieut. K. P. MacNamara, S.R., from an Assistant Equipment Officer: May 12.

Temp. Second Lieut. N. B. Fuller, King's Royal Rifle Corps, and to be transferred to General List; Second Lieuts., S.R., G. S. Thorne, S. N. Cole, C. J. Q. Brand, R. S. Carroll: May 14.

Lieut. H. H. Balfour, King's Royal Rifle Corps, S.R., from 10th King's Royal Rifle Corps; Second Lieut. G. D. F. Keddie, London Regt., T.F.; Second Lieut. H. M. Probyn, Royal Warwickshire Regt., T.F.; Temp. Second Lieut. D. V. Armstrong, General List: May 15.

Second Lieut. (on probation) V. M. C. B. de Savigny, York and Lancaster Regt., S.R., and to be seconded: May 16.

Flying Officers, from Flying Officers (Observers):

Second Lieut. A. D. Bell-Irving, Gordon Highlanders, S.R.; Temp. Second Lieut. H. C. Evans, General List; Lieut. F. W. H. Simpson, R.A.; Temp. Second Lieut. H. C. Hopkinson, General List: May 15.

Flying Officers (Observers):

Second Lieut. (Temp. Lieut.) H. G. Thornton, Northamptonshire Regt., T.F.; Temp. Second Lieut. H. Hamer, North Lancashire Regt., and to be transferred to the General List; Second Lieut. D. H. de Burgh, R.A., and to be seconded; Second Lieut. W. S. Caster, Hunts Cyclist Bn., T.F.; Second Lieut. (on probation) P. W. Spurr, Royal Berkshire Regt., S.R., and to be seconded; Temp. Second Lieut. H. L. Lascelles, Yorkshire Regt., and to be transferred to the General List: April 1.

Second Lieut. (Temp. Lieut.) D. C. Beck, R.A., T.F.; Second Lieut. J. A. Williamson, Royal East Kent Yeomanry, T.F.: April 28.

Second Lieut. A. G. A. Davis, Devonshire Regt., and to be seconded: May 14.

Assistant Equipment Officers:

The appointment of Temp. Second Lieut. J. L. Miles, General List, is antedated to January 27.

Second Lieut. F. A. Crispin, S.R.; Second Lieut. C. N. Seemann, S.R.; Temp. Second Lieut. O. W. Clapp, General List: May 13.

To be Temp. Second Lieuts. for duty with the R.F.C.:

Corp. H. D. Hamilton, from 10th New Zealand Mounted Rifles; Pte. F. Crisp, from Inns of Court O.T.C.; Pte. D. H. Broughton, from City of London Yeomanry, T.F.; Pte. A. B. Raymond-Barker, from Inns of Court O.T.C.: May 27.

Appointment of Second Lieut. W. G. Stewart, S.R., as a Flying Officer is antedated to May 3.

Temp. Capt. C. D. M. Campbell, R.F.C., S.R., to be Temp. Major (without the pay or allowances of that rank) whilst specially employed: May 18.

The undermentioned to be Temp. Second Lieut.:

Pte. R. B. Mellor, from H.A.C., T.F., to be Temp. Second Lieut. for duty with the R.F.C.: May 27.

The following N.C.O.'s and men to be Temp. Second Lieuts. on probation, for duty with the R.F.C.:

Corp. E. E. Castle, from R.F.C.; Lance-Corp. W. H. Buckridge, from A.S.C.; Lance-Corp. C. J. Beatty, from 2nd Canadian Divisional Supply Column; Pte. R. F. Browne, from 2nd Canadian Divisional Headquarters Sub Staff: April 30.

Staff Serg. B. F. Wood, from A.S.C.; Corp. C. P. Creighton, from 2nd Canadian Divisional Signal Co.; Second Class Air Mech. L. Taylor, from R.F.C.: May 7.

Acting Serg-Maj. W. B. Power, from R.F.C.: May 30.

Second Lieuts. to be Lieuts.:

G. O. Hayne, W. E. Collison, J. E. Marriott, P. D. Robinson, H. E. van Goethem, D. A. L. Davidson, F. W. Steat: May 1.

SPECIAL RESERVE

Second Lieut. (on probation) C. T. L. Millington relinquishes his commission: May 13.

Second Lieuts. (on probation) are confirmed in their rank:

A. T. Thompson, A. N. Patterson, E. D. L. Davies, H. L. Saunders, C. R. Fry, P. R. Meredith, W. G. Stewart, T. L. Brennan, G. S. Hall, I. Curlewis, S. E. Faber, G. S. Thorne, S. N. Cole, F. A. Crispin, C. N. Seemann, O. C. Morison, C. J. Q. Brand.

G. H. Armstrong, R. M. W. Browne, A. J. Hamar, D. Cloete, R. Buck, H. B. Prior, G. F. Golding: June 4.

Second Lieut. (on probation) S. Pope is removed from the Army, the King having no further occasion for his services: June 4.

To be Second Lieuts. (on probation):

H. B. FitzHerbert: May 1.

R. Watts: April 18.

A. N. David, H. W. Sidley, E. E. Glorney, P. V. Tanner, N. A. Phillips, J. I. Jones, P. B. Pattison, F. Scarborough, J. R. Verel, E. P. M. Shaw, H. A. Rigby, J. V. A. Glead, H. E. R. Fitchat, C. D. Bennett, F. S. Rowe, L. L. M. Evans, A. Roberts, B. W. Pitt, G. H. Lee, A. S. Hett, W. S. Frackleton, P. A. Symmons, J. P. Stephen: May 27.

PROGRESS AT THE FLYING SCHOOLS

The Grahame-White School.—Straights with Instructor: Kaye, Phillips, Ballard, Cooper, Ward, Edwards, Donald, Goodhart, Cockelle, Forster, and Rabourdin. Circuits and Eights with Instructor: Turner, De Beer, and Smith. Brevet during week: Spenser.

The Hall Flying School.—Instructors' reports dated Saturday, June 3:—With P. G. Allen: Skinner, Russell, Jones, Guy, Illingworth, Cordner, and Davis. With Charles Bell: Deane, Dickson, Gudger, Skinner, Collier, Worswick, and Rand. With Cecil M. Hill: Taylor, Rochford, Worswick, Rand, Gaskell, Jones, and Guy.

Machines in use: Hall and Caudron Government-type tractors.

Royal Aero Club Certificates taken by Taylor and Rochford; both of these pupils taking splendid certificates at an average height of 1,000 feet and faultless vol-planes from 2,000 feet and beautifully judged landings. The Brevet tests were taken on 70 h.p. Isaacson Hall-Caudron tractor biplane, fitted with 90 Curtiss "Ebora" propeller.

SOCIETY OF MOTOR MANUFACTURERS AND TRADERS

Aero Committee.—The following gentlemen were elected members of the Aero Committee by the Council:—H. White-Smith (chairman) (British and Colonial Aeroplane Co., Ltd.), S. D. Begbie (Aster Engineering Co. (1913), Ltd.), B. Caillard, (Wolseley Motors, Ltd.), R. O. Cary (Sopwith Aviation Co., Ltd.), L. Coatalen (Sunbeam Motor Car Co., Ltd.), A. J. Crump (H. M. Hobson, Ltd.), C. Grahame-White (Grahame-White Aviation Co., Ltd.), F. Lamplough (Lamplough and Co., Ltd.), Capt. Lutwyche (Farnham), F. May (Green Engine Co., Ltd.), Handley Page (Handley Page, Ltd.), A. Pedler (North British Rubber Co., Ltd.), T. C. Pullinger (Arrol-Johnston Co., Ltd.), F. W. Shorland (Clement-Talbot, Ltd.), F. R. Simms (Simms Motor Units, Ltd.), G. Holt-Thomas (Aircraft Manufacturing Co., Ltd.), G. H. Thrupp (Thrupp and Maberly, Ltd.), H. T. Wright (J. Samuel White and Co., Ltd.), Major Wood (Vickers, Ltd.).

NEW ALTITUDE RECORD.—Two new height "records" have been established by the French airman Poirée. Carrying four passengers, he reached a height of 4,000 metres (about 13,000 ft.), and with five passengers he reached 3,000 metres (about 9,850 ft.).

NAVAL OFFICERS' FLYING ALLOWANCE.—It is announced that certain naval officers are to receive an allowance for adjusting the compasses of aircraft of 2s. 6d. for each machine; and officers performing the duties of senior lieutenant at certain air establishments and stations are to receive senior allowance of 1s. 6d. a day where the numbers borne are not less than 350.

LEGAL NEWS

AVIATOR'S LIBEL ACTION

Mr. F. G. King, of Bournemouth, who was stated to have been the late Gustav Hamel's manager, was ordered at the London Sheriff's Court on May 31 to pay £75 libel damages to Mr. F. F. Trotman, of Mill Hill. Counsel said that plaintiff, who was manager of Wilton's engineering works at Hendon, instructed a solicitor to apply to King for payment of a debt of £38. At this King wrote to Major Geo. Wilton, proprietor of the works:

"I have no hesitation in calling this demand by a very serious and very ugly name. Mr. Trotman is still in my debt."

The effect of the letter has been disastrous to the plaintiff (said counsel). Major Wilton had instructed Mr. Trotman to dispose of the works at Hendon. Defendant was either a Canadian or an American, who held part of the capital of the Bournemouth Aerodrome, and until recently was the owner of the Royal Hotel, Southampton.

BOOKS RECEIVED

"THE YEAR BOOK OF WIRELESS TELEGRAPHY AND TELEPHONY, 1916." London: The Wireless Press. 1,916 pp. 876 illustrations. Price 3s. 6d. net.

AIRCRAFT TROPHIES

The Secretary of the War Office makes the following announcement:—

"With reference to the Order in Council of the 10th inst., amending the Defence of the Realm Regulations, the War Office request that the public will render assistance by notifying at once to the military authorities, or to a police constable in the neighbourhood, the finding of any bomb or projectile or fragments thereof, or any other article discharged, dropped, or lost from any enemy aircraft or vessel."

PATENT INFORMATION

This list is specially compiled for AERONAUTICS by Messrs. Rayner and Co., Registered Patent Agents, of 5, Chancery Lane, London, from whom all information relating to Patents, Designs, Trade Marks, etc., can be obtained gratuitously.

LATEST PATENT APPLICATIONS

- 6,782-3 U. Antoni. Aeroplanes. 11/5/16.
- 6,744 F. C. Jenkins. Aircraft. 11/5/16.
- 6,844 W. F. Jones. Aeroplanes. 13/5/16.
- 7,182 Fairey Aviation Co. Seaplanes, flying boats, etc. 19/5/16.
- 7,182 C. R. Fairey. Controlling devices for aeroplanes. 19/5/16.
- 7,221 L. M. M. Hall. Aeroplanes. 20/5/16.
- 7,185 P. C. Jenkins. Aircraft. 19/5/16.
- 7,008 J. T. Parker. Armoured aeroplanes. 16/5/16.

SPECIFICATIONS ACCEPTED

- 12,706 Keith. Aeroplanes, hydro-planes, airships, and the like.

SPECIFICATIONS ACCEPTED THIS WEEK

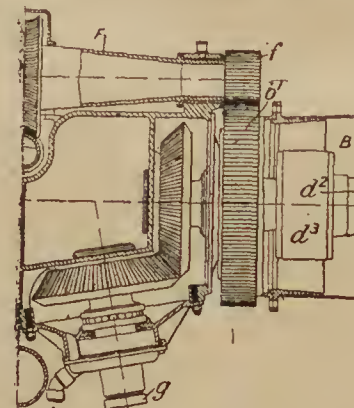
- 14,713 Walker. Flying machines.

SPECIFICATIONS PUBLISHED THIS WEEK

- 10,211 Vickers, Ltd., and Bourcier. Aeroplanes.
- 12,706 Keith. Aeroplanes, hydro-planes, airships, and the like.

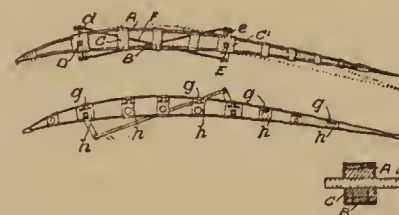
LATEST PUBLISHED ABSTRACTS

- 1,488 Vickers, Ltd., and H. B. Pratt, Vickers House, Broadway, Westminster. Relates to adjustable propellers for airships and comprises an arrangement of propellers in which the torques arising in the inter-connected swivelling tubes are equal and opposite, so that the effort required to turn the tubes is reduced to a minimum. In the arrangement shown, the swivelling tubes *B* surround the



driving shaft *d2* of the propellers and are connected by a shaft *F* and pinions *f*, *b1*. The propellers are mounted on gear-boxes on the outer end of each tube *B*, and are driven by bevel-gear from the shafts *d*. The gear-boxes are arranged so that the propellers are displaced equally and their weights are balanced around this axis.

- 1,692 "Aeronautics." P. C. Elliott, Lawrence, Kansas, U.S.A. A flexible rib for the wings of aeroplanes comprises upper and lower strips *A*, *B*, slidably connected by blocks or distance-pieces *C*, *C1*. The camber by the rotation of spars *D*, *E*, which are secured to the blocks



C1 and interconnected by rods *F* and cranks *d*, *e* to turn in relatively opposite directions. In one form, the strip *B* is secured to the blocks *C*, *C1*, and the strip *A* slides in the blocks. In another form the distance-pieces *h*, Fig. 4, between the strips are secured to the lower rib and provided with a slot engaged by a clip *g* secured to the upper strip.

Printed copies of the published specification and abstracts can be obtained from Messrs. Rayner and Co., at the price of 1s. each.

AERONAUTICS

A WEEKLY JOURNAL DEVOTED TO THE TECHNIQUE OF AERONAUTICS

(FOUNDED 1907)

Edited by JOHN H. LEDEBOER, B.A., A.F.Ae.S.

VOL. X. No. 139 (NEW SERIES)

JUNE 14, 1916

[Registered at the G.P.O.]
as a Newspaper

ONE PENNY

DEVELOPMENTS AND REQUIREMENTS

NOT one of us, in the nature of things, foresaw all the details of aerial warfare as we know it to-day. The air has created its own traditions and lore, and its own uncanny skill. Few are left of the members of those first three squadrons which crossed the Channel with the original Expeditionary Force, crossed never dreaming to return. But some have survived, have won honour and glory—wholly incommensurate in many cases to their deserts—and have become past masters in the art of air-fighting, to take only the most spectacular part of their avocation.

* * *

Despite the immensity of aerial space, which led most of us, even as recently as two years ago, to believe that practically any aeroplane could fulfil its mission unscathed so long as it remained within measurable distance of our lines, the enormous and rapid increase in the number of aircraft on both sides, the development of their individual fighting capacity, and the knowledge which each possesses of its opponent's air centres, added to the stationary nature of the hostile front, these facts have upset all our previsions, which have vanished into the limbo of long-forgotten things. In a science so young, so nascent even, as aerial warfare no definite rules can be laid down or conclusions drawn. You will encounter among those entitled to speak the upholder of individual effort and the squadron commander who prefers to send up his machines to accomplish individual tasks without any clearly defined regime of co-operation and mutual support. In the opposite camp reigns the school which favours flying by squadrons in close formation.

* * *

In all probability the event will prove neither view to be wholly right and both to be partially wrong. The evolution of the purely fighting machine, the swift scout, the destroyer of the air, has rendered it necessary to protect the slower reconnaissance and gun-spotting machine, which is not primarily intended to fight and is only armed for defence. The Germans understand this point excellently well; the French even better; and hence we have seen growing aerial battle tactics as we know them to-day and combined aerial operations. A scout is a poor weight-carrier and an indifferent bomb-dropper, but it possesses the rapidity of manœuvre essential to fighting tactics. This being so, the French have found it expedient to attach to each of their heavy and relatively slow bomb-dropping squadrons on raiding intent a detachment of swift destroyers or chasers, whose function it is to deal with any hostile craft encountered. So, too, each section of the front patrolled by relatively slow reconnaissance machines has usually in support a flight of chasing planes, of limited radius, but possessing great speed and climbing power.

* * *

A second point: the more one considers the matter the more evident it becomes that for escaping the delicate attentions of an adversary or for tackling him in the air with the best prospects of success, rapid and sustained climbing power is essential. Superior climbing power connotes the advantage in speed, since speed, if lacking under

level conditions, can be acquired by diving. He who has or can command the upper berth will, other things being equal, always hold an incontestable advantage.

* * *

Take the case of a heavily armed and therefore relatively slow bomb-dropper of imposing proportions of the type of which we have lately heard so much. Send it aloft in broad daylight; let it meet three or four fighting scouts superior in climbing power and in speed; the more powerful craft, for all its armament, which in weight of metal may be superior over all its enemies combined, is at a fatal disadvantage. At night-time matters are different, but of this more anon. The fighting machine, the destroyer, to give it the most appropriate title, should therefore possess *in excelsis* the dual qualities of swift climb (speed will follow) and rapid manœuvring power.

* * *

The bomb-dropper, by reason of the heavy useful load it carries in fuel and ammunition, is perforce sluggish. With the advent of the destroyer it suffered heavy casualties. Hence the remarkable development in recent times of night flying. And the extraordinary fact is that the greater proportion of reconnaissance and gun-spotting work is done under cover of darkness, the latter being rendered comparatively simple by locating hostile batteries by the gun-flashes. The increasing use made of night flying, once the bugbear of every aviator, is among the most remarkable developments of the war, the more so since by its adoption the aeroplane, by rendering itself invisible, has once again regained its ascendancy over "Archie," whose superiority by daylight is nowadays nothing less than uncanny, and has forced the reconnaissance machine to seek a precarious safety at 12,000 ft.; though it is my opinion that the 7,000 or 8,000 feet level remains comparatively the safest of all.

* * *

A final point. Our official reports continually glory in the fact that our own machines cross the enemy's lines far more often than his venture over ours. Our pride in this matter is legitimate enough, since the fact proves that our fellows are willing to and do carry out their duties irrespective of risks. But the Hun is no fool, neither is he a coward. And there is another side to the question, which I have never yet seen referred to in print, but which was pointed out to me by an officer just returned from the front who happens to be unusually competent to judge in this matter. Be it observed that Archie the Hun is distinctly our superior in the number of his bag. This may be explained very plausibly on the ground that our machines cross his lines far more frequently than his own pilots expose themselves to our anti-aircraft guns. Precisely; but, on the other hand, Archie the Hun may be top dog—and his accuracy is certainly remarkable—for the simple reason that we give him a far better chance to practise—by offering him continual targets—than he offers our gunners. The point is certainly worth noting, the more so since Archie has unquestionably progressed more rapidly than the aeroplane in these last two years.

J. H. L.

SPECIFICATION FOR MILITARY AEROPLANES

APRIL 24, 1916

AS noted in our last issue, the U.S.A. Signal Corps on May 9 issued specifications for a first batch of twelve military aeroplanes for the U.S. Army. We are enabled to publish these specifications in full. It is to be noted that the specifications originally called for Hall-Scott six-cylinder 125 h.p. motors, but will no doubt be extended to include motors of other types.

SPECIFICATION

I. PRELIMINARY—This specification describes the design, construction, equipment, and requirements of a military aeroplane adapted to land reconnaissance.

II. GENERAL REQUIREMENTS—The following characteristics shall be proven to the satisfaction of the inspectors appointed by the Government for that purpose:—

(a) This aeroplane shall be a two-place tractor biplane with one fuselage, and shall be equipped with one motor. It shall be suitably constructed for carrying a pilot and one passenger, and shall be designed for carrying a useful load comprising the following:

1. Pilot and passenger, 330 lbs.
2. Instruments and equipment, 150 lbs.
3. Supply of gasoline, oil, and water necessary for a flight of six hours' duration, with motor turning continuously the number of revolutions per minute required for its rated horse-power. The rate of fuel consumption may, at the discretion of the inspectors, be based upon a flight of two hours' duration with motor turning continuously the number of revolutions required for its rated horse-power. There need be only one such flight for the entire group of machines.

Unless otherwise specified in the order, the useful load carried on all performance tests shall be equivalent to the above.

(b) The motor shall be a Hall-Scott, 6-cylinder, 125 horse-power, internal combustion engine.

(c) The safe horizontal low speed shall not exceed 46 miles an hour.

(d) At the discretion of the inspectors, at least one machine of the group delivered, to be chosen at random by the inspectors, to attain an altitude of not less than 10,000 ft. above sea level, starting with the above useful load.

(e) The airworthiness and general flying qualities of the aeroplane to be satisfactory. These include celerity of response to control; the proper degree of symmetric and asymmetric stability (static and dynamic); steadiness in disturbed air, etc., under various flying conditions.

In order to determine these attributes, an army pilot may, at the discretion of the inspectors, fly any or all machines, executing sharp figures of "8," dives, stalls of various kinds, side-slips, sudden stopping of motor while climbing steeply, releasing of controls for a period of time after the machine has been steadied in horizontal flight, and such other manœuvres as he may deem necessary to determine the general suitability of the machine.

(f) Standard Curtiss control shall be installed in the rear cockpit (shoulder or chest yoke). Provision shall be made for dual control. The control shall not be installed in the front cockpit, but will be furnished complete and ready for installation. The action of the controls shall be positive, reliable, and give a proper power ratio. The lateral control shall be double acting.

(g) Factors of safety will be required as follows:

1. Main plane structure:

Conditions assumed:

- (a) Load as above.
- (b) Angle of incidence of mean chord of main planes: That of maximum lift coefficient.
- (c) Air speed: That normally corresponding to the above load and angle of incidence for the net effective surface area.

Factor of safety is to be not less than eight.

2. Body and tail structure:

Conditions assumed:

- (a) Air speed of 100 miles an hour.
- (b) Angle of incidence of fixed horizontal tail surface: Minus 6°, elevator surface: Minus 20°.

Factor of safety is to be not less than 2.5.

3. The strength of construction of all parts (extreme flying and landing conditions being considered) to be satisfactory.

(h) All details of construction, including those in the "Instructions to the Inspector at Factory during Construction," which forms a part of these specifications, to be satisfactory, and conform to the best proven and approved practice.

(i) With proposals for aeroplanes to be constructed under this specification, shall be submitted drawings of a complete machine. These drawings shall be accurate to scale; scale being approximately 1 inch equals 24 inches, and shall show:

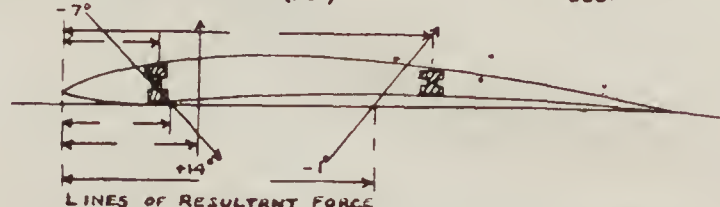
1. Plan.
2. Front elevation.
3. Side elevation.

All principal dimensions, areas, and relative angles shall be entered on these drawings.

In addition to the above, the data indicated on the standard forms enclosed herewith shall, as far as is practicable, be included.

WING STRUCTURE

TOTAL WEIGHT OF MACHINE (FULL LOAD)	LBS
WEIGHT OF MAIN PLANES	LBS
DIFFERENCE	LBS
MAXIMUM AIR SPEED POSSIBLE IN A VERTICAL DIVE	MI/HR
FOR ALL STRENGTH CALCULATIONS THE FOLLOWING VALUES ARE USED	
LOAD CARRIED BY UPPER WING	LBS.
SPAN OF UPPER WING	INCHES
LOAD PER INCH RUN ON UPPER WING	LBS
LOAD CARRIED BY LOWER WING	LBS
EFFECTIVE SPAN OF LOWER WING	INCHES
LOAD PER INCH RUN ON LOWER WING	LBS.
LIFT OF ONE AILERON (20°)	LBS
DRIFT OF ONE AILERON (20°)	LBS.



PER CENT OF LOAD ON	-7°	-1°	+14°
FRONT SPAR			
REAR SPAR			

STAGGER ° DECALAGE °
DIBEDRAL ° RETREAT °

ALL STRUTS HAVE ENDS HINGED

LINE OF TENSION OF EACH WIRE PASSES THRU INTERSECTION OF NEUTRAL AXIS OF SPAR WITH AXIS OF STRUT

FORMULAE USED IN DETERMINING STRESSES ON SPARS, DUE TO COMPRESSIVE LOAD, TO BEND. MOMENT, AND TOTAL; - GIVING NUMERICAL VALUES OF ALL COEFFICIENTS
[SAME FOR STRUTS, CABANE MEMBERS, ETC]

THE ULTIMATE TENSILE AND COMPRESSIVE STRENGTH (POUNDS PER SQUARE INCH) FOR THE MATERIAL IN EACH PLATE FITTING, BOLT, SCREW, PIN, TURNBUCKLE, WIRE, CABLE, AXLE, STRUT, CONTROL SURFACE YOKE, ETC., THROUGHOUT THE MACHINE.

ALSO A BRIEF DESCRIPTION OF THE COMPOSITION OF THE MATERIAL, HISTORY OF HEAT TREATMENT, TEMPERING, ETC FOR EACH OF THE ABOVE

SHEET 1

III. ADDITIONAL FEATURES CONSIDERED DESIRABLE—Statements covering each of the features enumerated below shall accompany the bid. These statements will be considered and be given due weight in awarding the contract. Tests demonstrating these features may, at the discretion of the inspectors, be included among the final acceptance tests.

(a) *Manœuvring on the Ground:* Manœuvring ability on the ground shall be satisfactory. The machine shall be capable of making reasonably sharp turns to right and left, or of being driven along a straight course in any direction with respect to a moderate wind.

(b) *Landing Gear:* The landing gear shall be of two-wheel type and such as to render the machine capable of being landed in, or flown out of a field in which the ground is fairly soft or fairly rough, and to undergo without injury a moderately rough landing.

(c) *Field of Vision:* The fields of vision for pilot and observer shall be satisfactory. These will be indicated on the blue prints submitted with the bid.

(d) *Arrangement of Seats:* The seats shall be arranged in tandem, the pilot's seat being directly in rear of that for the observer.

(e) *Cockpits*: The edges of both cockpit holes shall be well padded, and a suitable transparent wind shield provided for both pilot and observer. The seating and cockpit arrangement for pilot and observer shall be comfortable, secure and convenient, and such as to permit, as much as is possible at the same time, easy observation and protection against draught. The arrangement of the cockpit shall be such as to permit pilot and observer to get clear of the machine quickly in the event of an accident, without undue danger of becoming entangled in wires, etc.

(f) *Instruments and Accessories*: The following instruments and accessories shall be provided. Their location, design, and arrangement shall be such as to cause them to function with satisfactory precision and reliability under various flying conditions:

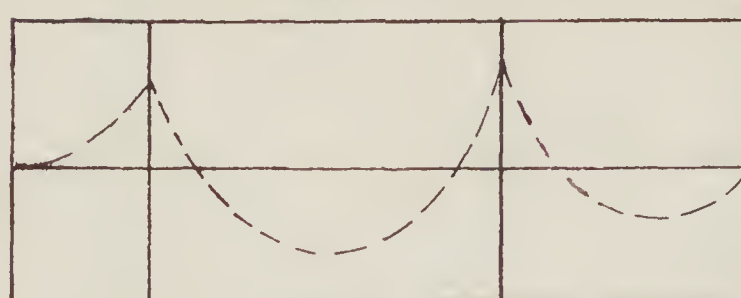
1. Aneroid barometer, graduated in feet, registering from sea level to 12,000 feet, to be installed in rear cockpit.
2. Clock in rear cockpit.
3. Two Sperry compasses and one synchronised ground drift indicator. The ground drift indicator to be in forward cockpit and connected to both compasses, one in each cockpit.
4. Two three-pint water bottles, one installed in each cockpit.
5. Case or box for tool kit, to be installed immediately in rear of the pilot and readily accessible.
6. Two map cases. Rolling map case in rear cockpit. Folding shelf map desk in forward cockpit.
7. Shaft revolution speed indicator, to be installed in rear cockpit (Warner tachometer preferred).
8. Gasoline supply gauge in rear cockpit.
9. Oil supply gauge in sump, to be visible from rear seat.
10. Radiator water thermometer, visible from rear seat.
11. Throttle control (both hand and foot, if control permits) to be installed in rear cockpit, and also provided ready for installation but not installed in forward cockpit.
12. Ground wire switch to be installed in rear cockpit, and also provided ready for installation but not installed in forward cockpit.
13. Carburettor adjustment, control for altitude (if necessary), to be installed in rear cockpit.
14. Spark advance control to be installed in rear cockpit.
15. Pressure indicator for gas system, visible from rear seat.
16. Compression release in rear cockpit.

(g) *Motor Installation*: The ease and convenience of removing motor from, and installing motor in aeroplane, with a minimum disturbance of connections, controls, structure, etc., shall be satisfactory for field service. The housing around the power plant should be readily detachable, and, in addition, have means to permit convenient access to all parts of the motor which may require adjustment or inspection.

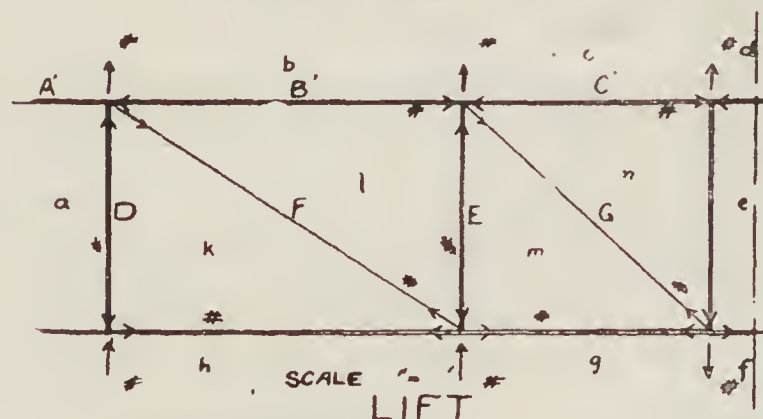
(h) *Gasoline Tanks*: A gravity feed tank capable of holding a supply sufficient for at least 40 minutes running at full rated horsepower of the motor to be securely installed in such a place that the feed

STRESSES IN REAR SYSTEM

ANGLE OF INCIDENCE -1°
LIFT LOAD PER INCH RUN ON REAR SPARS { UPPER LBS.
LOWER LBS.
IN COMPUTING COMPRESSIVE LOADS ON UPPER REAR SPAR COMPONENT
OF TOTAL FORCE ALONG PLANE OF STAGGER HAS BEEN CONSIDERED.

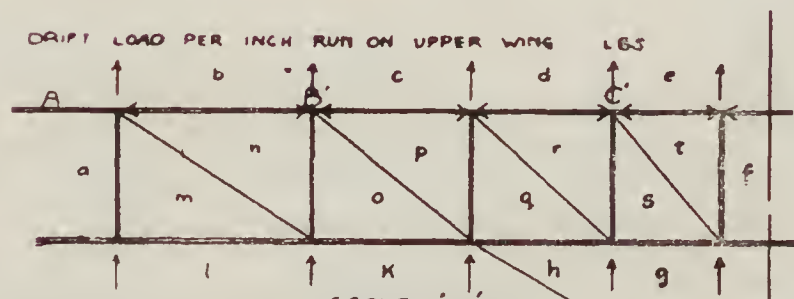


UPPER SPAR



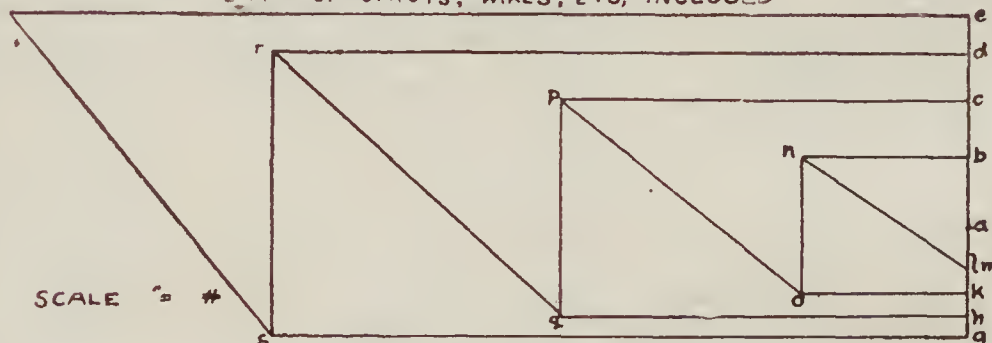
LIFT

SCALE " = #



DRIFT

DRIFT OF STRUTS, WIRES, ETC., INCLUDED



SCALE " = #

DATA FOR STRUTS

SYMBOL	MATERIAL	MODULUS OF RUPTURE	AREA OF SECTION (MIDDLE)	TAPER OF AREA	LEAST RADIUS OF GYRATION	LENGTH INCHES	COMPRESSIVE LOAD (DIAGRAM)	STRESS LBS. PER SQ. IN.	FACTOR OF SAFETY
D'									
E'									

DATA FOR WIRES

SYMBOL	NUMBER OF WIRES	MATERIAL	DIAMETER	ELASTIC LIMIT	BREAKING LOAD	LOAD (DIAGRAM)	FACTOR OF SAFETY
F'							
G'							

DATA FOR UPPER SPAR

	PANEL		
	A'	B'	C'
MATERIAL			
MODULUS OF RUPTURE			
AREA OF CROSS SECTION			
MOMENT OF INERTIA SECTION ABOUT HORIZONTAL AXIS			
DISTANCE FROM NEUTRAL AXIS TO FURTHEST FIBRE			
LENGTH BETWEEN POINTS OF SUPPORT-INCHES			
ENDS HINGED OR CONTINUOUS			
MAXIMUM BENDING MOMENT			
MAX DEFLECTION MID-SPAN DUE TO BEAM LOAD			
MAX STRESS DUE TO B. MOM. LBS. PER SQ. IN.			
MAX STRESS MID-SPAN DUE TO B.M. LBS. PER SQ. IN.			
AXIAL COMP. LOAD DUE TO LIFT (DIAGRAM)			
AXIAL COMPRESS. LOAD DUE TO DRIFT, ETC. (DIAG.)			
MAX STRESS DUE TO TOTAL COMP. LOAD-LBS/SQ. IN.			
MAXIMUM TOTAL FIBRE STRESS LBS. PER SQ. IN.			
FACTOR OF SAFETY			

shall be positive, reliable, and sufficient in all flight altitudes up to 30° inclination, either climbing or gliding.

(i) *Fuel Supply System*: If gravity feed is not used throughout, a positive and reliable system of pumping gasoline from the reserve tanks to the gravity tank shall be provided.

(j) *Service Pipes and Connections*: Gasoline, water, and oil service pipes and connections to be proof against vibration. A positive means of cutting off the gasoline supply at the service tank shall be readily accessible from both seats.

(k) *To Stop Motor*: At least one reliable method of stopping the motor shall be provided, capable of operation from either seat.

(l) *Carburetion and Oil Feed with Motor Tilted*: The oil supply system, carburetion, etc., shall be such as to permit the motor running satisfactorily at angles of inclination up to 30° (either way) to the horizon.

(m) *Back Fire Protection*: Positive and reliable means should be provided to prevent back fire spreading beyond the carburettor. This shall be effective for all flying conditions and attitudes of the machine, including that of motor running while upside down.

(n) *Vibration*: The vibration at various motor speeds, and under various conditions, must not be excessive.

(o) *Assembly, Disassembly, and Packing*: The provisions for rapid assembling and disassembling, and for packing in crates of convenient size and shape for transportation shall be satisfactory. Detachable bolts, fittings, and other parts shall be as few in number and as simple as is consistent with other requirements.

(p) *Inspection for Defects: Faulty Construction, Poor Material, etc., Brought Out in Tests*: An inspection of a machine immediately after any test to show that all parts and connections of the power plant and of the aeroplane are in good condition.

IV. THE PROPOSAL OF THE MANUFACTURER WILL INCLUDE GUARANTEES RELATIVE TO:

(a) Performances under Paragraph II., i.e., load, low speed, factor of safety, etc.

(b) Paragraph III., i.e., additional desirable features.

(c) The following:

1. *The Climb*: The manufacturer will guarantee that under conditions as set forth under Paragraph II. (a) and V., his machines will attain an altitude of not less _____

(to be filled in by manufacturer)

feet in 10 minutes.

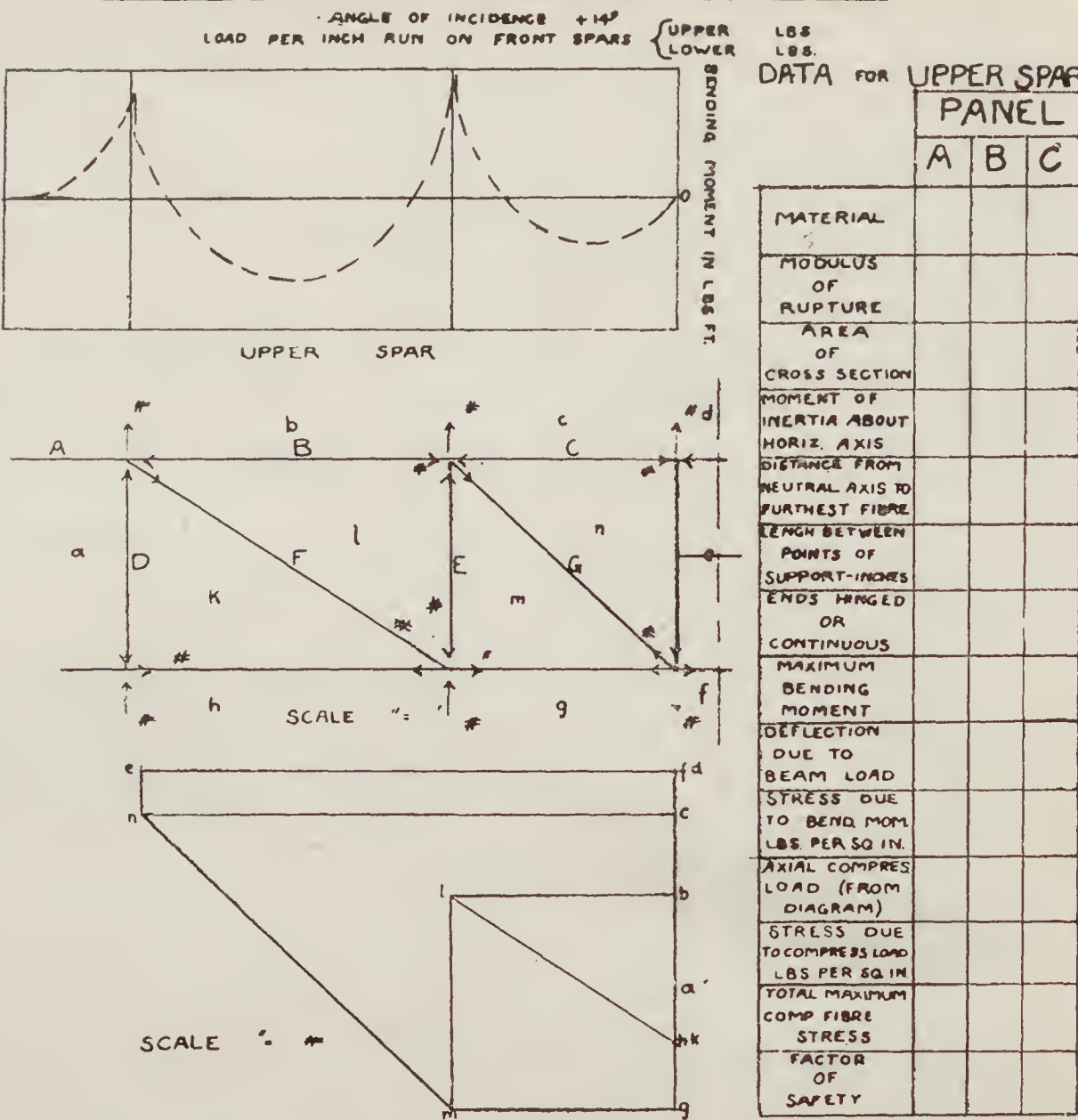
Note—The barograph records will be corrected for calibration errors only.

2. *High Speed*: The horizontal high speed to be not less than _____ miles per

hour. (to be filled in by manufacturer)

3. *The periods of time required to complete each machine ordered*. The time specified shall include date of receipt of order, and date of delivery of each machine. By date of delivery for each machine will be meant the date on which the machine will be ready for officially observed tests at an aerodrome provided by the manufacturer (unless otherwise specified in the order). (See requirements for speed course under V.) The purpose of this provision is to insure the manufacturer having completed his preliminary and experimental tests and having each machine in a state for acceptance tests by the date of delivery guaranteed by him.

STRESSES IN FORWARD SYSTEM



DATA FOR STRUTS

SYMBOL	MATERIAL	MODULUS OF RUPTURE	AREA OF SECTION (MIDDLE)	TAPER OF AREA	LEAST RADIUS OF GYRATION	LENGTH INCHES	COMPRESSIVE LOAD (DIAGRAM)	STRESS LBS. PER SQ. IN.	FACTOR OF SAFETY
D									
E									

DATA FOR WIRES

SYMBOL	NUMBER OF WIRES	MATERIAL	DIAMETER	ELASTIC LIMIT	BREAKING LOAD	LOAD (DIAGRAM)	FACTOR OF SAFETY
F							
G							

SHEET 3

A penalty of three-tenths of 1 per cent. of contract price will be imposed for each day required over and above the time specified in the order. The only allowance for delays will be due to strikes, riots, fire, or other disasters, or other causes which are clearly not the fault of the manufacturer.

4. Price of:

- (a) Each machine complete with motor and propeller.
- (b) Each component aeroplane part.
A complete list with proper designating numbers and prices shall be included.
- (c) Spare motors, complete, without radiator or propeller.
- (d) Each component motor part.
A complete list with proper designating numbers and prices shall be included.

All guarantees shall be so worded that it will be unnecessary to re-write the guarantees should order be placed. Example: "If order for aeroplane (or aeroplanes) to be constructed in accordance with Signal Corps specification No. is placed

with me (or name of company), I hereby guarantee, etc. . . ."

Suitable crates and boxes for transportation shall be furnished by the contractor, and all work and material incident to shipping the aeroplane, its accessories, and spare parts to destination specified in the order shall be provided by the contractor. Shipment will be made on Government bill of lading, unless otherwise specified in the order.

V. TESTS: Any or all of the following rules governing the method of conducting performance tests may be enforced, at the discretion of the inspectors:

(a) Any or all machines must pass any or all tests to demonstrate guaranteed performances, and to demonstrate that all provisions of this specification have been complied with.

(b) All tests shall be started at approximately sea level.

(c) For all tests the power plant and aeroplane shall be identical in every detail with the arrangement it is proposed to use in practical service in the field.

(d) The same type propeller, the factor of safety of which is satisfactory, shall be used for all tests.

(e) The motor shall not be driven during any performance test at a speed greater than 1,400 revolutions per minute.

(f) The gasoline used to be of a grade which, in the opinion of the inspectors, is readily obtainable in field service. By this is meant standard automobile gasoline testing not higher than 65 Beume.

(g) The number of officially observed attempts for each performance shall be decided upon by the inspectors at the time of the tests.

(h) Before arriving at the starting point for each of the speed tests, machines must be flown at a height of not more than 25 feet for a distance of not less than 900 feet. The original altitude must be maintained over the specified course from start to finish.

(i) The location and length of the course for the speed tests shall be decided by the inspectors. The course for the speed tests should be level and be between 1,000 and 2,000 yards in length. The location, length and suitability of the course, if one has already been chosen by the manufacturer before the commencement of the official tests, must meet with the approval of the inspectors.

(j) The period of time for the climb shall start at the instant the wheels leave the ground for flight.

(k) Climbing and speed tests shall be made by a pilot in the employ of the company.

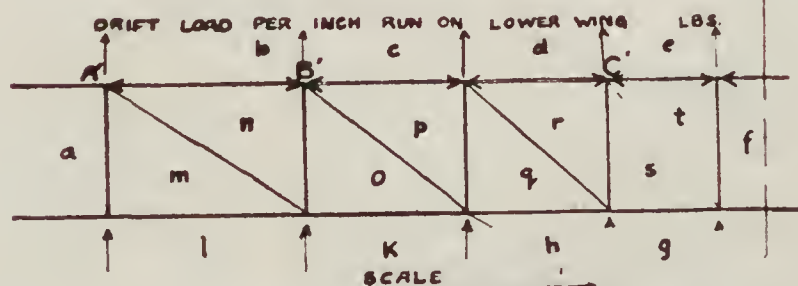
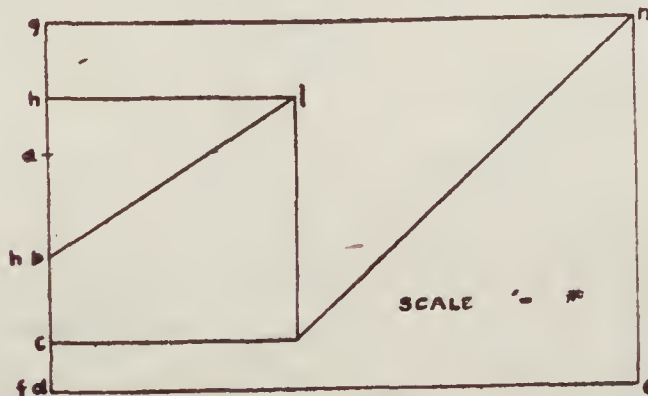
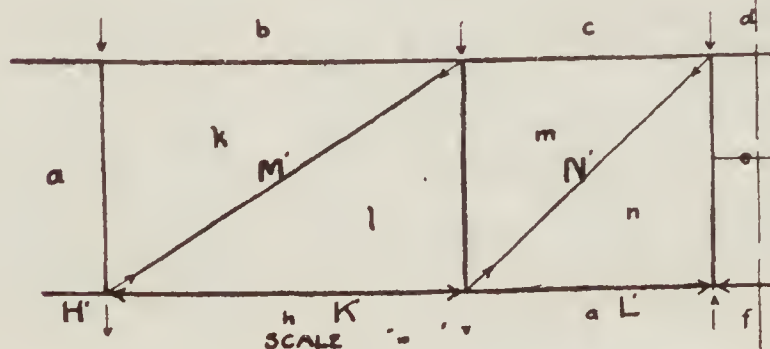
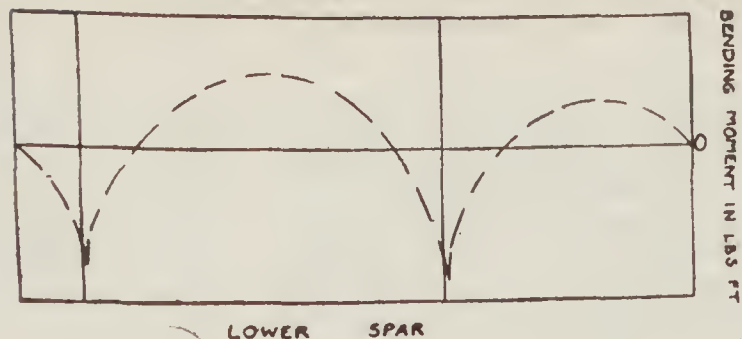
(l) Stop watches, barographs, and other instruments necessary for measuring the speeds and the rate of climb, shall be provided by the Government. The fuel and oil shall be supplied by the manufacturer, and shall be subject to test by the inspectors.

(m) The inspectors may, at their discretion, prohibit unreasonable delays in performance tests, caused by adjustments in power plants or aeroplanes which would not, in the opinion of the inspectors, be practicable in field service, or which should have been made before the date of delivery as defined under IV. (c) 3.

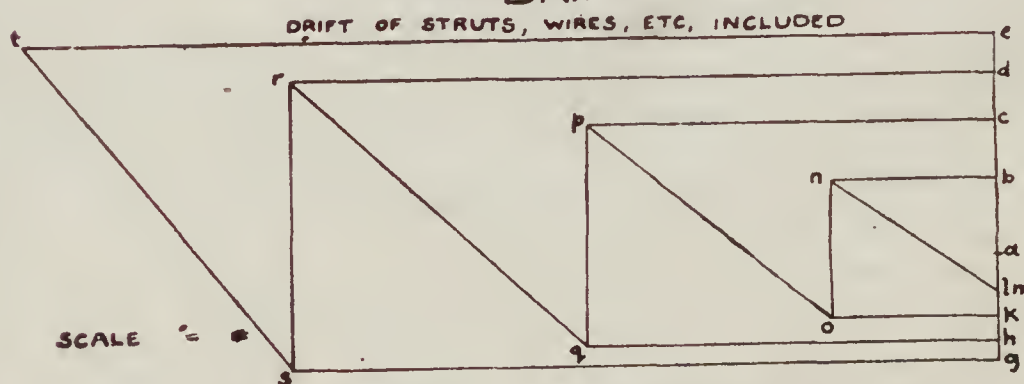
(To be continued)

STRESSES IN REAR SYSTEM

ANGLE OF INCIDENCE -7°
LIFT LOAD PER INCH RUN ON REAR SPARS



DRIFT



DATA FOR STRUTS

SYMBOL	MATERIAL	MODULUS OF RUPTURE	AREA OF SECTION (MIDDLE)	TAPER OF AREA	LEAST RADIUS OF GYRATION	LENGTH INCHES	COMPRESSIVE LOAD (DIAGRAM)	STRESS LBS. PER SQ. IN.	FACTOR OF SAFETY
D'									
E'									

DATA FOR WIRES

SYMBOL	NUMBER OF WIRES	MATERIAL	DIAMETER	ELASTIC LIMIT	BREAKING LOAD	LOAD (DIAGRAM)	FACTOR OF SAFETY
M'							
N'							

UPPER LBS.
LOWER LBS.

DATA FOR LOWER SPAR

MATERIAL	PANEL		
	H'	K'	L'
MODULUS OF RUPTURE			
AREA OF CROSS SECTION			
MOMENT INERTIA SECTION ABOUT HORIZON. AXIS			
DISTANCE FROM NEUTRAL AXIS TO FURTHEST FIBRE			
LENGTH BETWEEN POINTS OF SUPPORT- INCHES			
ENDS HINGED OR CONTINUOUS			
MAXIMUM BENDING MOMENT			
MAX DEFLECTION MID-SPAN DUE TO BEAM LOAD			
MAX STRESS DUE TO B MOM. LBS. PER SQ. IN.			
MAX STRESS MID-SPAN DUE TO B.M. LBS. PER SQ. IN.			
AXIAL COMPR. LOAD DUE TO LIFT (DIAGRAM)			
AXIAL COMPRESS. LOAD DUE TO DRIFT, ETC. (DIAG.)			
MAX STRESS DUE TO TOTAL COMP. LOAD- LBS./SQ. IN.			
MAXIMUM TOTAL FIBRE STRESS LBS. PER SQ. IN.			
FACTOR OF SAFETY			

MODEL AEROPLANES—XXXIV

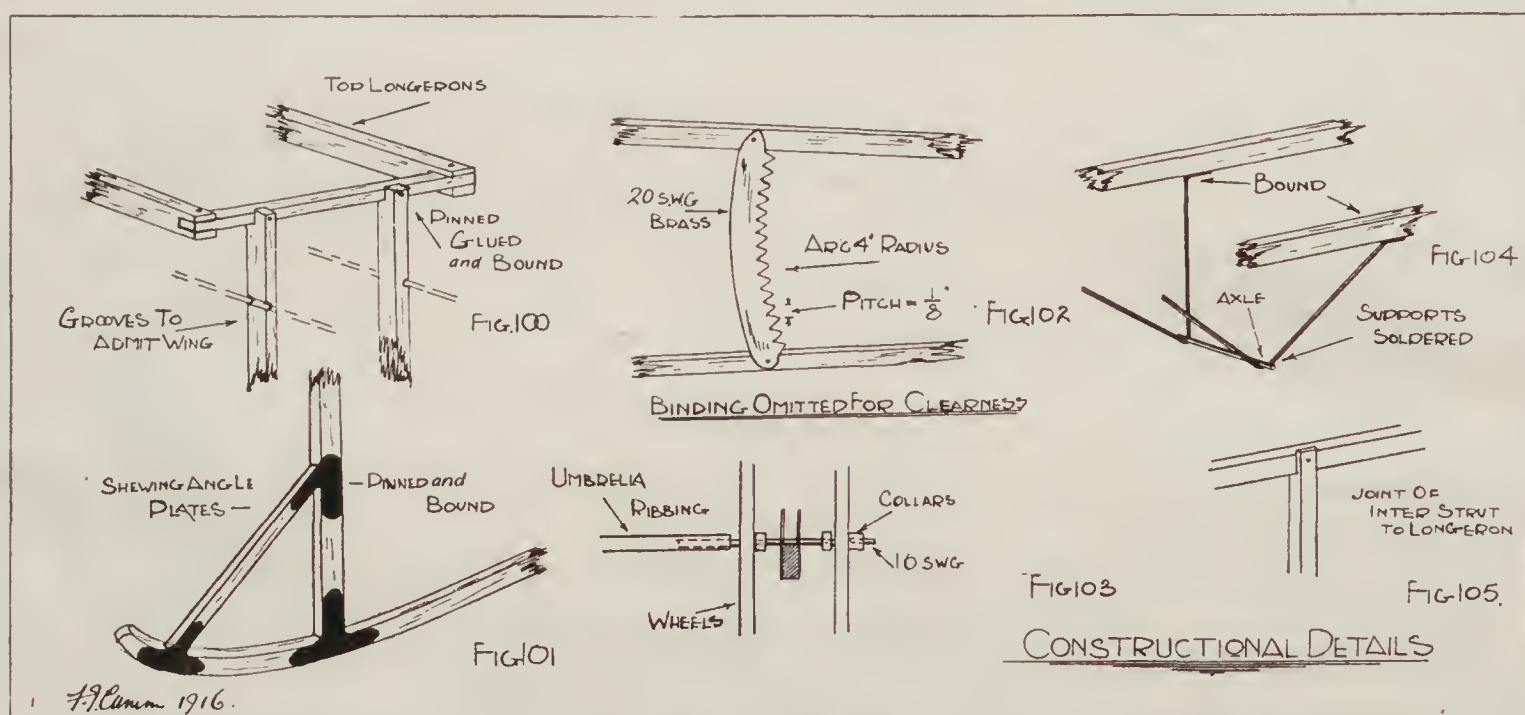
By F. J. CAMM

THE upper and lower longerons are spanned at the tail end with light spruce crossbars, $\frac{1}{8}$ in. by a $\frac{1}{4}$ in. section, which are let into mortices cut in the longerons; and two vertical posts are halved on to these cross members (see Fig. 100), to provide the fulcrum about which the tail swings in the quadrant, to be referred to presently. They are spaced 4 in. apart, which is equivalent to the distance between two ribs; and on the outside of them a groove is cut in the centre of each to provide a seating for the two central tail ribs. These grooves must be cut V-shaped, the apex of the V facing the trailing edge of the post. The object of the groove is to form a guide for the tail when it is desired to alter the angle of it. A pin should be driven through the rib and into the groove to constitute the pivot on which the tail swings; and the ribs must be bound with fine thread on each side of the pin to prevent the rib from splitting. It will be wisest to bind the ribs first, before inserting the pin.

The central inter-struts are attached to the skids by angle plates, and in Fig. 101 the form these are to take is given.

that Fig. 103 will make obvious the construction. It will be seen that the piano wire beds into the channel (which is fixed in a trailing position), wherein it is bound and soldered. The wheels are spaced apart by means of small brass-tube collars, soldered to the piano wire axles in the respective positions. The axle itself, as mentioned last week, is attached between the shock-absorber brackets, being held there by means of suitable radius wires secured to any convenient part, the rubber binding forming the absorber. The radius wires are essential in order to maintain the lateral position of the axle relatively to the planes. Sufficient rubber binding is to be used to absorb the shocks the model is bound to receive, the exact quantity, of course, being impossible to define.

The rear wheel members are fixed to the longerons in a similar way to that which I have illustrated on several occasions. The ends are bent back parallel to align with the frame member. The apices of the V chassis members are soldered to the short axle carrying the back wheel, the axle being cut a length suitable to the hub of the wheel.



It must be understood that there are two plates to each joint, one on each side of it, and for neatness and simplicity they can be cut from one piece of tin, both plates being thus formed in the one. Fig. 101 shows such a one marked out; it represents the front inter-strut plate connecting the skid, and the general idea of setting the other plates cut will be apparent from this. Thirty-gauge tinplate is suited to the purpose. They are pinned, clenched, and bound into place, and constitute an exceedingly rigid piece of construction, which is needed in this portion of the machine, bearing as it does the impact of landing. Glue should be neatly brushed into all the joints. The tie strut is to be streamlined as far as practicable without materially impairing the strength of it.

A very neat finish can be given to the binding if it is just brushed round with Japan black, which shows up in pleasing contrast to the light brown varnish with which the framework is coated.

Fig. 102 gives the shape of the quadrant which makes possible the variation to the angle on the tail. It is cut to a radius of 4 in., and is pinned into position. The pitch of the teeth is $\frac{1}{8}$ in., and this facilitates a very fine adjustment. It should be so fixed that the tail springs tightly into the notches, but not so tightly as to render adjustment difficult. Trial and error will be found the best method of locating its position.

I mentioned last week that the axle was composed of two portions, umbrella ribbing and piano wire, and I hope

Twenty-gauge wire is used for all portions of the rear chassis.

Fig. 105 indicates the joint of the trailing central inter-struts to the top longeron. It will be clear that the joint is a halved one, pinning and binding forming the security.

All woodwork may be polished by filling the grain with gold size and finishing with a good varnish. In flying the model I should like to point out that full pressure should not be given to the plant until adjustment has been completed. I would also impress the importance of tuning the machine by rising off ground; it will obviate many vexing smashes. Further, the rudder must be set to counteract torque; if the screw is of left-hand pitch then torque will tend to bank the machine to the right, and the rudder must therefore be set to the left.

(To be continued)

REPLIES TO CORRESPONDENTS

D. N.—Small petrol motors are not very successful for models. The Bonn-Meyer (illustrated some time back in these columns) and Stanger petrol motors are the most successful, and these are of power suited to very large models only. In any case do not use a single cylinder engine—vibration and uneven torque being the chief disadvantages. Compressed air and steam (flash boiler) are the only two practicable power plants irrespective of the rubber motor.

MODEL EDITOR

WILBUR WRIGHT LECTURE

THE LIFE AND WORK OF WILBUR WRIGHT*

By GRIFFITH BREWER, A.F.Ae.S.

THE fourth Wilbur Wright Memorial Lecture, printed below, on "The Life and Work of Wilbur Wright," was delivered on June 6 by Mr. Griffith Brewer, under the auspices of the Aeronautical Society of Great Britain, at the Royal Society of Arts. Lord Montagu of Beaulieu presided.

Lord Montagu first referred in a few words to the death of Lord Kitchener. Turning to the subject of the lecture, he stated that most of the work of real value to mankind was done outside official circles and by private individuals, and it was nearly always opposed at its outset both by the pure scientist and by Government Departments. The Wrights had the wonderful quality which we called intuition. They had not at their disposal any very great means of looking at their problem from a purely scientific point of view.

THE LIFE AND WORK OF WILBUR WRIGHT

The Wilbur Wright Lecture this year is not an addition to the store of science, but is merely a tribute to that great addition contributed by Wilbur Wright, which gave to man the third and greatest highway for inter-communication.

This exception to the generally scientific character of the lecture has been considered desirable, because the publication of the results of new research at the present time would not be wise, and also the opportunity is favourable to give to the members of the Aeronautical Society a more accurate picture of the life and work of Wilbur Wright than they may be able to gather from casual observations which have appeared from time to time in various publications.

Wilbur Wright was born eight miles due east of Newcastle, Indiana, on April 16, 1867. His brother Orville was born on August 19, 1871, after the Wright family had moved to Dayton, Ohio, in the meantime. Wilbur and Orville grew up with their

down from any cause, the magic touch of its owner readily put things right. There seemed to be a bond of sympathy between Orville and his first printing machine, for a glance from him seemed enough to set it running again when the efforts of the printing staff had failed. It was on this first printing machine that Orville printed his first boys' paper, which charmed the youth of the neighbourhood and helped to enthuse the boy army of West Side, of which he was the captain. Later he obtained a more efficient printing outfit, and on March 1, 1889, while still only seventeen years old, he launched his first weekly newspaper under the title of the *West Side News*. For the first three months Orville was editor and publisher combined of the little four-page weekly, and then the size of the paper was increased and Wilbur joined his brother in the capacity of editor, Orville becoming the publisher. In April, 1890, Orville and Lorin started an evening newspaper under the title, *The Evening Item*, but this enterprise was evidently too large for their resources, for after a run of four months it ceased to appear. In October, 1894, Wilbur and Orville Wright commenced the publication of a little weekly magazine, entitled *Snap-Shots*, in which Wilbur Wright contributed an article on local affairs in the form of an imaginary discussion supposed to have taken place at the Idlers' Club. Those members who knew Wilbur Wright in France will remember his quiet sarcasm with some of the scientists who came to Le Mans to criticise the aeroplane which they did not understand, and they will no doubt appreciate the humour and the courage of his writings.

Wilbur was a fearless critic, and he wrote on matters of local interest in a kindly but vigorous manner which did much to maintain the healthy public municipal life of the town of his childhood, and I was fortunate, on my last visit to Dayton, in persuading Orville and Lorin to let me bring back to England some of the precious copies of these papers, containing examples of Wilbur's early journalistic work. I have chosen one article written by Wilbur and published in the Wrights' paper, *Snap-Shots*, on November 17, 1894, as being typical of his writings at that time, and showing how his wit and wisdom were used to defend a critic who had ventured to criticise the action of four members of a local authority who were bringing four actions for libel against the local critic of their public work. The article in question is in the form of the weekly report of the proceedings of an imaginary body termed "The Idlers' Club," and is reproduced in the Appendix to this lecture.

THE WRIGHT CYCLE CO.

These literary efforts and the attendant business of printing were carried on in the building at the corner of Third and Williams Streets, Dayton. Afterwards Wilbur and Orville Wright formed the Wright Cycle Co., at 1127, West Third Street, on the other side of the road to that of the printing and publishing business, and there as cycle manufacturers they produced the "Van Cleve" bicycle, a machine which earned great local repute for its excellence of construction, a reputation which lives years after the machine itself has ceased to be manufactured. The adoption of the name of "Van Cleve" for the bicycle manufactured by the Wright Cycle Co. is interesting from the fact that it was named after their ancestor, Catherine Van Cleve, who was one of the first settlers to land at Dayton from a boat on the river Miami on April 1, 1796, at a time when the country was virgin forest, inhabited by none but Indians. Catherine's daughter Margaret had a daughter Catherine, who married Dan Wright the younger on February 12, 1818. Milton Wright (father of Wilbur and Orville) was born to them on November 17, 1828, and was fourth son and fifth child.

It is interesting to notice how loyal the Wright Brothers were to Dayton, and especially to the West Side where they lived. No doubt the business portion of the town would have proved more profitable to them, when starting one of their newspapers, or when starting their bicycle business. Then when they invented their great invention, which was one of world-wide interest, one would have thought that there must be some other town in America better suited for the manufacture of the flying machine. Whether they were prompted to bring the new industry to their native town, simply because it was their home, or whether they recognised Dayton as a town with exceptional business possibilities, will probably never be known; but the fact remains that they did choose their home town for the new manufacture and they also invested some considerable portion of the fruits of the invention in improvements in the West Side.

THE BROTHERS' FIRST AERONAUTICAL WORK

Although Wilbur and Orville had from their early childhood taken a keen interest in the possibilities of human flight, it was not until 1896 that they gave more than passing attention to the subject of flying. It was then that they took up the problem seriously, and studied with great interest the aeronautical information then available. Lilienthal's work and writings especially

WEST SIDE NEWS.

Vol. 1.		DAYTON, OHIO, MAY 25, 1889		No. 12	
West Side News.					
PUBLISHED WEEKLY.					
Wilbur Wright . . . Editor					
Orville Wright . . . Publisher					
TERMS—Quarter of year, twenty cents Six weeks, ten cents.					
1810 WEST THIRD STREET DAYTON, OHIO.					
Ancient Warriors.					
Before the invention of gunpowder a battle was little better than a group of hand to hand conflicts. Stout sinews and muscles were then valued, and the strong man was especially esteemed. William Wallace was the Scottish chief, not only for his patriotism but also because he had a giant's strength. Once, when attacked by five men, he killed three and put the other two to flight.					
Parrot Chorus.					
The traditional "fish story" has many varieties, to which it seems only fair to add the following, even though the fish in this case was a parrot. Doubtless its narrator, an American artist, designed it to be "taken for what it is worth."					
He was very fond of knocking about in out-of-the-way quarters of the world, and once left ship with a ship of comrades, in order to explore a Central American wilderness. During the cruise of several months, the entire ship's company had devoted their leisure hours to singing to a parrot. The sailor had also lost no opportunity of teaching the bird all the nautical phrases they knew.					
When the artist and his comrades had hidden the bird and the sailors good-by, they plunged into the heart of the tropical forest, and after a most exertion to accomplish					
forbidding all others, cleave only unto her, so long as you both shall live!"					
The minister paused for the response. The groom hung down his head, and was silent, but the bride, in a staccato tone, exclaimed, "Yes, sir, I'll see to it that he does all that!"					
It was evident who would rule in that household. But a Scotch clergyman once married a groom who insisted upon promising to obey his wife. The clergyman, while traveling through a village, was requested to officiate at a marriage, in the absence of the parish minister. Just as he had told the bridegroom to love and honor his wife, the man interrupted the words, "and obey." The clergyman, surprised to find a husband willing to take a promise usually made by the wife alone, did not heed the proposed amendment. He was going on with the service when					
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THE WEST SIDE BUILDING					

THE WRIGHTS' FIRST EFFORT

elder brothers, Reuchlin and Lorin, and their younger sister Katherine, and they were fortunate in having a broad-minded father who encouraged them to expand their thoughts, and did not place obstacles in the way of their natural development. Bishop Milton Wright originally intended his son Wilbur to follow in his footsteps and enter the Church; but although Wilbur had considerable literary talent, his inclinations and somewhat weak health drew him toward more active pursuits.

The city of Dayton, now a town of 120,000 inhabitants, is divided by the river Miami, and the portion of the town situated on the west of the river is known as the "West Side." The business quarter of Dayton is contained in the "East Side," the west being more used for residential purposes, but the inhabitants of the West Side take a local pride in the progress of their portion of the city, and have striven hard to import similar prosperity to the west to that enjoyed by the east.

EARLY JOURNALISTIC WORK

Wilbur and Orville, imbued with this local pride, commenced their activities in the West Side, and one of the earliest efforts made by Orville was in the running of a printing press. He was a boy in his teens at the time, but this did not deter him from starting a printing business, which was only limited by the smallness of the machine at his disposal and by the small quantity of type. This first printing machine is recalled by the neighbours in West Side for the ingenuity of the makeshift contrivances of bits of string and pieces of wood, with which it was made to run in a businesslike manner, and when it broke

* The fourth Wilbur Wright Memorial Lecture, delivered June 6, 1916, at the Royal Society of Arts.

attracted them, and the fact that a man of Langley's great reputation had declared his belief in the possibility of human flight gave them confidence in attacking the problem which classed all who attempted it with lunatics and believers in perpetual motion. Wilbur Wright was never tired of praising the work of Lilienthal and of that great pioneer of the aeroplane, James [the lecturer's mistake. His name was John, not James.—ED.] Stringfellow, one of the founder members of the Aeronautical Society. At the banquet given on May 4, 1909, by the Aero Club to the Wright Brothers on their return to America after Wilbur's demonstration flights in France, Germany and Italy, in 1908-9, many of you will remember the tribute he paid in his speech to the great pioneer work of Stringfellow. He reminded us how our great pioneer member had devised an aeroplane having two propellers, a vertical rudder and a horizontal tail, and he made us realise how nearly we had approached the solution of the great problem. We recognised as he spoke that Stringfellow's aeroplane, had it been controlled and propelled with modern means and knowledge, would have been capable of sustained free flight. But we also recognised that these apparently little things were the things that count, for they were the links between the problem and the art. The very fact that the bridging of the gap had been repeatedly attempted in the intervening time without success had made the problem more forbidding and one that required more courage to attack as each experimenter entered and retired in his turn.

And so the Aeronautical Society of Great Britain, the oldest society concerned with aviation in the world, has weighed the valued work of all the pioneers, and it has never withheld the claim of America to the raising of the aeroplane from the problem to the art.

Neither Wilbur nor his brother Orville were the men to rest satisfied with theory or with paper experiments. They were firm believers in proving everything by practical experiment, and so the problem of flight was now attacked in a manner it had never been attacked before.

Never in the history of the world had men studied the problem with such scientific skill nor with such undaunted courage. They first studied all the books, then tested the data of Lilienthal and other authorities by building man-carrying gliders and risking their lives to find the truth which could not all be found by study at the fireside. Having found after two years' outdoor experiments in the air that the very axioms on which the art of flight reclined were, some correct, some inaccurate, and some absolutely false, they commenced a long series of laboratory experiments, and in the most scientific manner made thousands of tests with models of various forms of curved planes in a wind-tunnel, and tabulated thousands of readings, which even to-day, now fourteen years since, give equally efficient results to the more elaborate tables since prepared by learned institutions.

I have examined this wind-tunnel myself in the stable where it was stored two years ago, and have handled the little curved planes which Orville kept in one of the drawers of his desk, and I could not help coveting these treasures for this Society to honour and preserve. But this is a confession which I have never ventured to express, although it is possible Orville may have guessed it.

I was fortunate during my last visit to Dayton in having access to the diaries kept by Wilbur and Orville throughout their Kitty Hawk experiments, and the following portion of my paper was written partly from these diaries and partly from our conversations in the summer evenings of June, July and August, 1914.

THE FIRST GLIDER

In the summer of 1900, having ascertained from the Weather Bureau at Washington that the North Carolina coast had the strongest and the most constant winds, and the Postmaster at Kitty Hawk having given the neighbouring sand dunes a good testimonial as to their roundness and softness for boys playing with flying machines, Wilbur and Orville Wright transported the various parts of the glider which they had designed and partly built at their home at Dayton, assembled and completed building it in the tent which they brought with them. This first trip to Kitty Hawk occupied them nearly a week on the journey. Afterwards, when they knew the way better, the journey could be accomplished in three or four days. A tent was used on this first visit, and in following years they built a shed for housing the machine and for living in. They did not find the shed and household conveniences ready to receive them, but these were laid out on the sands, in the form of lumber and corrugated iron, which required sawing up and putting together in order to afford the comfort and joys of a Robinson Crusoe existence.

The gliding experiments were carried out by launching the machine down one of the Kill Devil Hills, and gliding against the wind, the operator lying face downward on the machine and grasping a bar capable of receiving a twisting motion, which enabled the man, by twisting his outstretched hands, to guide the machine up or down when elevating or depressing the forward elevator. The wing curves of this first gliding machine were designed by the Wright Brothers on their own lines, or as Orville said, "by guess," but the data of lift, "drift," resistance of struts and framework, were taken from the tables previously published by Lilienthal.

THE SECOND GLIDER

In 1901, the Wrights went to Kitty Hawk a second time, and on this occasion with a glider having a wing surface of 290 square feet, and weighing 98 lbs. This machine was believed to be an improvement on the original machine of the year before, having been designed on curves supplied to them by Mr. Chanute from Lilienthal's wing curves. This machine proved less efficient than the earlier machine. Nothing in the curve particulars supplied by Mr. Chanute mentioned that changes in curvature would alter the lift, nor that change in aspect ratio would alter the efficiency of a wing surface. The wings of the new machine were 22 feet span and 7 feet chord, and the horizontal elevator, at the front of the machine, was 7 feet distant from the front edge of the wings, and had an area of 18 square feet.

After making about 17 glides on July 27, it was found that the machine was less manageable than had been expected, the elevator being, as they imagined at the time, too large, and this was afterwards reduced to an area of 10 square feet. The best of the above glides was one of 315 feet in a descent of 1 in 6, time about 19 seconds, relative speed about 25 miles per hour in a wind of about 13 miles. The resistance of the framing was apparently more than had been expected from the Lilienthal tables and doubts arose as to the correctness in the tables of the ratio of lift to drift. Later, the machine was flown as a kite, but the lift obtained was found to be much less than the tables led them to expect, the amount of lift obtained being only one-third as much as it should have been. They had intended to experiment most of the time with the machine in an 18 miles an hour wind without much forward motion being necessary, so the poor lift of only one-third of that anticipated was very discouraging, because it would be necessary to glide in order to attain a sustaining speed through the air. The larger machine used in the experiments in 1901 was found to be less manageable than the smaller machine used the previous year, and this trouble was at the time attributed to the travel of the centre of pressure.

THE WIND TUNNEL EXPERIMENTS

On returning to Dayton in August, 1901, the Wrights decided to check the data given by Lilienthal by making independent experiments of their own, and they very soon found many discrepancies which filled them with interest and led them on to make experiments more thorough and complete than any scientific experiments on the subject hitherto made. They constructed their wind-tunnel 16 inches square, inside measurement, and about 6 feet long, into one end of which a current of air was blown by a fan, and the direction of the draught was straightened by a series of "pigeon holes." Beyond these wind straighteners pivoted arms were arranged, carrying the small model planes and wings to be tested, and more than two hundred miniature wings were tried in this wind-tunnel to ascertain their lift and drift. Many of these models were made to the same proportional curves but to different scales, in order to verify the results and to ascertain what difference, beyond that of proportion, change in scale might entail. Each model was tested at angles of 0° , $2\frac{1}{2}^\circ$, 5° , $7\frac{1}{2}^\circ$, 10° , $12\frac{1}{2}^\circ$, 15° , $17\frac{1}{2}^\circ$, 20° , 25° , 30° , 35° , 40° , 45° , and some thousands of readings were taken and tabulated, and it is on these readings that the subsequent work of the Wright Brothers has been based. Most of the models were made with an aspect ratio of 1-1, 1-4, and 1-6, and a few 1-2, 1-8 and 1-12. This was the first time that any systematic measurements had ever been taken to ascertain what relation aspect ratio had on various types of wing surfaces. Never before, so far as then known, had the relative lift of oblong surfaces been taken in comparison with square surfaces. These tables compiled by the Wrights have not yet been published, but they have been in constant use by the Wrights ever since. The tables of figures are contained in long pocket books, and members of this Society who have been with either of the brothers at any of their experimental flights will have observed them refer to these precious little volumes when making a calculation. The models tested in this way are made of sheet metal, mostly bent over centrally lengthwise, the bent-over portion forming the bluff leading edge of the required curve, the free edges for the plates being brought back together, one slightly in advance of the other, and after being joined being smoothed off with wax. Other surfaces tested are of a single thickness of sheet metal and curved to varying degrees, while still others are bent to arcs of circles.

The result of these experiments was the abandonment of the tables of earlier experimenters which the Wrights had previously used, and the third machine built for the purpose of the continuation of the experiments at Kitty Hawk, proved by the efficiency of its gliding angle that they were fully justified in going to the labour and expense of this independent scientific work.

THE THIRD GLIDER

On August 25, 1902, Wilbur and Orville Wright again left Dayton for Kitty Hawk in order to resume the outdoor experiments they had commenced in the two previous years. They had learnt much by the wind-tunnel experiments which they had made during the winter before, and these tests in the wind-tunnel enabled them to design and build the third glider of considerably greater efficiency than the two earlier gliders built to the old formula. Being experimenters of a practical turn of mind, they realised how necessary it was to test by practice in the air itself

the truth or falsity of apparent answers to the many problems. The aspect ratio of this new machine was 1 to 6, instead of about 1 to 3 as in the second machine, this change being decided on in view of the knowledge gained in the wind tunnel experiments made during the previous winter. The journey to their experimental ground was arduous enough to have daunted many who were less enthusiastic, for it first involved, if lucky in making train connections, 25 hours' rail journey to Elizabeth City, thence by sailing vessel to Dosher's Wharf, taking anything up to another 24 hours, and then by a small boat to the camp, situated four miles or so from Kitty Hawk. After arrival in camp, the remnants of the shed left by the winter gales had to be put into order, living arrangements put right, such as arranging the kitchen and driving a 16 ft. well, and so the first days were devoted to hard work in order to support existence before any thoughts of flying experiments could be indulged in.

On this third visit to Kitty Hawk, therefore, although the brothers left their home on August 25, 1902, it was not until September 8 that they were able even to commence work on the erection and construction of the glider. On September 10th the upper wings were ready, and a test of these was made for efficiency. It was found that the covering of the rear side of the rear spar made the centre of pressure reverse sooner than when left exposed. On September 13 the lower wings were finished. On September 16 the struts and connections of the upper and lower wings were completed sufficiently to enable the partly finished machine to be again tested, and on September 19 the machine was completed ready for making free glides. The above will give some idea of the work and discomfort that had to be gone through before any actual experiments could even be commenced, and after doing all this the very first experiment might bring a smash entailing at the least the recommencement of the constructional work, or better still, the discovery of some error, which although entailing tedious alterations, would weed out one more snag from the road to human flight.

Both Wilbur and Orville Wright made careful observation of the flight of birds. The buzzard, which frequents North Carolina and uses the strong up currents rising from the heated sand and deflected upwards by the sand dunes, was often observed with special interest. On one occasion some buzzards were observed soaring over the sand hills. The conditions appeared to be such that they were unable to soar over plains, but they took to the hills where they had considerable trouble in gaining altitude of more than 50 to 75 feet above the top of the large hill. Orville describes how they watched the buzzards with field glasses at a distance of 1,200 feet. The angle of the birds above the horizon was from $4\frac{1}{2}^{\circ}$ to $5\frac{1}{2}^{\circ}$ taken with a clinometer. They could see the underside of the wings all the time when the birds faced them, being directly in line with the wind from them, and the upper side of the wings could be seen when the birds soared away from them. The velocity of the wind was from 6 to 8 metres per second, and the slope of the hill $12\frac{1}{2}^{\circ}$.

The third machine, which was completed on September 19, contained 305 square feet of surface on the upper and lower wings, the front elevator contained 15 square feet, and two vertical surfaces 11 2-3rd square feet. The same afternoon about 25 glides were made and the front elevator was found to give ample longitudinal control with a change of not more than two or three degrees to either side of the central position of 0° .

SUCCESSFUL GLIDES

The following afternoon several glides were made down the large hill, Wilbur making one of these glides in 11 seconds, covering a distance a little over 200 feet, in which the machine began to gradually slide towards the side of the right wing, which was the lower one. The flight was made a little to the right of the direction of the wind, and the wind getting under the left wing from the side raised it higher and higher, when suddenly by mistake, while attempting to alter the wing tips, he turned the front elevator down at the rear, causing the machine to assume an angle apparently of over 45° . In the descent from this position, the height of the left wing became still higher as compared with the right, and the machine made a fast downward plunge directly towards the right wing. Before striking the ground, the torsion of the wings brought the left wing down considerably, and the machine running almost directly at right angles with the wind, struck on the right wing and swung round with the wind blowing from the rear.

Later in the same afternoon a number of tests of the torsional effect were made by running with the machine down a 7° slope on the smallest sand hill, and it was found that the wing with the larger angle, though started with the wind blowing from the other side of the machine and under the opposite wing and sidling off, would swing around the lower wing having the smaller angle. The afternoon's experiments were concluded with a glide made by Wilbur 140 feet down the north-east slope of the small hill with an angle of descent of $7\frac{1}{2}^{\circ}$. Wind velocity at place of start 5 1-6 metres per second and at place of landing 4 1-6 metres. The relative wind was estimated at 18 to 20 miles per hour, this estimate being based on a run made by Orville down the hill over the course of the glide with the anemometer and watch, in which the anemometer recorded 69 metres and the watch 6 3-5 seconds. His speed in running was probably greater than that attained by the machine at any time by two or three miles.

As a result of the above experiments, the truss wires were altered so as to give an arch to the wings, making the ends four inches lower than the centre, and the angle at the tips greater than at the centre. The machine was then flown as a kite with very satisfactory results. By these alterations the trouble experienced heretofore with a cross wind turning up the wing it had first struck had been overcome, and these trials seemed to indicate that the arching of the surfaces laterally produced the opposite effect. The machine now flew beautifully, and at times, when the proper angle of incidence was attained, seemed to soar, although the angle of the hill was only a little over $6\frac{1}{2}^{\circ}$.

In some of the glides made afterwards by Wilbur, he remained stationary in the air, without descending the hill or losing his altitude from the ground for periods of four or five seconds at a time, or until he was compelled to descend for safety, when the angles of the wings needed changing, these being fastened stationary during these glides. Orville also made his first free flights that season, gliding on the N.N.W. slope of the big Kill Devil Hill, where the slope at its greatest was $9\frac{1}{2}^{\circ}$. After about half a dozen attempts, he made a glide of about 160 feet with a total angle of descent of $5^{\circ} 57'$. Soon after Wilbur began to use the end controls, and found that with the changes made the day before they worked perfectly, or rather as Orville observed, they would work perfectly when they had learnt to manipulate them properly. It was found, however, that the machine still had the fault of suddenly turning up further and further in front when the wind got under one wing, unless the front elevator was turned a little downward in order to overcome this effect. Wilbur made a number of glides, in which he descended from almost a standstill in the air, with one end down, landing however on one wing with no damage to the machine. On one of the glides made by Orville, from a distance of 175 feet above the bottom of the hill, the machine turned up steeply in front, lost all headway, and with one of the wings up at a large angle descended for 20 or 25 feet backwards, and finally landed going forward with one wing up at an angle which appeared to be nearly 45° , but was probably less than that. It speaks volumes for the strength of the structure that no damage was done to the machine.

A "SMASH"

The last glide made by Orville ended in disaster. He was flying the machine with the control loose, so that he could adjust it during flight, when he noticed that one wing was gradually getting a little too high and the machine was slowly "sidling" off toward the low wing. He thought that by moving the end control mechanism an inch or so he would bring the wing back to its proper position. The next thing he knew, the wing was very high in the air, a great deal higher than before, and he thought he must have moved the side control in the wrong direction. Thinking of nothing but the side control, after reassuring himself of the proper direction, he threw the wing tips to their greatest angle. By this time he found that the machine was descending backwards towards the lower wing, from a height of 25 or 30 feet, as a result of the machine having turned up at an angle of nearly 45° in front, which fact he had not noticed while occupied in manipulating the controls of the wing tips, but which had been witnessed by Wilbur and by Dan Tate with alarm for several seconds before. The result of this experimental glide was a heap of flying machine, cloth and sticks in a pile, with Orville in the middle without a bruise or scratch of any description.

This adventure terminated the experiments for the day, and surprising as it may seem, it left them in the highest spirits, for the encouraging performances of the machine, both in control and in the angles of flight, far outweighed the work that would be entailed in repairing the machine. It is small wonder that they should be pleased at the result of the experiments, seeing that the machine glided at least 3° better than any glider had ever glided before, and they had gained the valuable information that a machine with a front elevator is liable to tilt upwards when the relative wind is from one side, owing to the wind striking on the under side of the front elevator. It is evident that only extreme optimists could succeed in experiments of this kind, optimists with a steadfast resolution to carry them over the many obstacles, each of which once surmounted left one more snag behind without disclosing the number still ahead.

* * *

Lord Montagu, in moving a vote of thanks to the lecturer, said he had told them many things made known to the world for the first time.

Lord Northcliffe, who seconded the motion, said: Mr. Brewer, who has been through all the great struggles of the Wright patents, was a devoted friend of those most modest inventors and knew them much more intimately than I did. Many of you will recall the fact that when they arrived in Europe very few believed that they were able to fly at all. Mr. Griffith Brewer will remember that great day when Wilbur, after all the great care he took in preparing his machine—after, I think, a fortnight of preparation—rose from the earth and, to the immense astonishment of the French people gathered there, who had been waiting for days, rose in the air and disappeared.

We are so accustomed to seeing flying machines nowadays that it is rather difficult to remember the enthusiasm, fascination, and excitement of seeing a man fly for the first time. I remember that

first aeroplane. It was very rough, very simple. The motor was not only one of very small power, but, from the point of view of modern flying machines, very crude. The Wright brothers, however, were not people who took very much interest in appearances. They knew that their machine could fly. They took no risks. Every part of that machine was perfectly made from the practical point of view. But, as in the case of many practical things one sees in the United States, there was no attempt at the finish one sees in the aeroplanes of to-day. The fact, however, remains that after more than a hundred years of experiment with aeroplanes these two brothers were the first two people in the world who made a machine to fly and flew it. I make that remark emphatically, because there is one aspect of the matter to which Mr. Griffith Brewer did not call attention, and that is the attempt of people to rob the Wright brothers of the priority of this invention. We have heard very little of that in England, but a prophet is not without honour save in his own country, and in the United States there has been a long and persistent attempt to belittle the originality of Wilbur and Orville Wright. I have closely followed the history of the hundred years of aeroplane experiments, and I have the unswerving conviction that the credit of the first flying aeroplane is due to the Wright brothers, and, from the point of practical flying, to nobody else. I know that these words of mine will go across the Atlantic. I believe that they will assist in stopping the spread of the insidious suggestion that the Wrights did not invent the aeroplane. One knows how public delusions grow up, and it requires such a lecture as Mr. Griffith Brewer's, with those unanswerable photographs and his deep knowledge of

the early days of the work, to demonstrate and re-demonstrate to the world that Wilbur and Orville did this thing.

I wrote to Mr. Brewer a few months ago saying what I thought of their acceptance of our payment for inventions invaluable to this country, not merely as a source of industry, a living for scores of thousands of our people, but as probably the greatest means of defence of this island in the future. I think every one will agree with me that these two brothers behaved in a splendid and handsome manner to Great Britain. The Wrights were Americans, not English people, but they were Americans of English descent. They had a great affection for this country, and their sister, in writing to me the other day, said: "We here make no pretence of being neutral. We are heart and soul with England and her Allies in this great struggle."

Major-General R. M. Ruck, in proposing a vote of thanks to the Chairman, congratulated Lord Montagu on his marvellous escape in the Mediterranean. They as a society had always believed in the great future of flight, not only from a naval and military point of view, but also in its commercial aspect. He would like to thank Lord Northcliffe, on behalf of the society, for the great interest he had always taken in the matter, and to say how glad they were to see him present.

Brigadier-General F. G. Stone seconded the motion.

Lord Montagu, in responding, expressed his satisfaction at seeing Lord Northcliffe present. He went to Le Mans to see Wright fly in October, 1908, and he saw, as anyone must who had a spark of imagination, the enormous possibility of flight. No one could tell to-day how far it might go.

AIRCRAFT IN ACTION

OFFICIAL INFORMATION

ENGLAND

June 6—Inclement Weather—Yesterday (June 5), owing mainly to the inclement weather, there is nothing to report about operations in the air.

June 9—Successful Aerial Work—Yesterday (June 8), in the air, under better weather conditions, a large amount of successful work was carried out. A considerable number of hostile aircraft was seen but there are no combats to report, and our machines carried out their duties with practically no interference.

June 10—Bombs on Our Trenches—The enemy sprang two mines south of the Virestraat-Wytschaete road, causing slight damage to our trenches, but damaging their own trenches also. Following these explosions, hostile aeroplanes dropped bombs ineffectively on to our trenches.

June 11—Fokker Driven Down—Rain and thunder storms interfered with air work during the greater part of yesterday (June 10). During the fine intervals some successful artillery work was accomplished and six combats took place. A Fokker was driven down and crashed in a field near Hasbourdin.

RUSSIA

June 9—Enemy Machine Brought Down—In the neighbourhood of Molodetchno station an enemy aeroplane dropped four bombs. Five German aeroplanes carried out a raid on the small town of Logishin, north of Pinsk, dropping about 50 bombs. One machine was brought down by our artillery fire and fell in the German lines.

ITALY

June 6—Bombs on Ala and Verona—Enemy aviators threw bombs on Ala and Verona, wounding three persons and doing some damage.

June 10—Enemy Camps Bombarded—Enemy aeroplanes dropped bombs at various parts in the Venetian plain. The total result of the raids was seven wounded and some material damage. One of our squadrons of Caproni aeroplanes bombarded enemy camps and works at Dazzees and in the Assa and Astico Valleys. All the aeroplanes returned safely.

June 11—Bombs on Fonzaso—Enemy aeroplanes dropped bombs on Fonzaso (about seven miles west of Feltre) without causing any casualties or material damage.

AUSTRIA

June 4—Enemy Aeroplane Shot Down—South-east of Lutsk we shot down an enemy aviator.

June 9—Bombs on Railway Stations—Our naval aviators dropped a number of bombs on the railway establishments at Portogruaro, Latisana, Pallazuolo, the inner fort of Grado, and an enemy naval aeroplane station. Our land aviators dropped bombs on the railway stations at Schio (south of Arsiero) and Piovere (Garda).

TURKEY

June 8—Enemy Aircraft Driven Off—One of our seaplanes attacked an enemy aeroplane which flew over Sedd-el-Bahr and chased it towards Imbros. We drove off another enemy aeroplane by the fire of our artillery.

June 9—Two Enemy Machines Shot Down—On the front near Aden two enemy aeroplanes were damaged and shot down by our fire. In the Straits sector we drove off two enemy aeroplanes which flew over Sedd-el-Bahr and Kumkale.

GERMANY

June 5—Aircraft Losses in May—The encounters of our aviators during May were most successful. The enemy lost in air fights 36 aeroplanes; shot down from the ground, nine, and from involuntary landings behind our lines, two; total, 47. Our own losses were—in air battles, 11; machines not returned, 5; total, 16. [This exceptionally clumsy lie was dealt with in our last issue.—ED.]

June 5—Three French Aeroplanes Brought down—In air battles near the Marre Ridge, near Cumières (both north-west of Verdun), and at Fort Souville (south-west of Vaux Fort), a French aeroplane was brought down in each case.

June 9—French Seaplane Shot Down—This afternoon (June 9) a French battle seaplane was shot down by one of our seaplanes. The occupants were picked up and taken into harbour by one of our submarines which was in the neighbourhood.

HOLLAND

June —Holland's Aerial Preparedness—The number of aeroplanes has been largely increased. These are provided with bombs, machine guns, and quickfiring, and, as regards speed and rising power, they have been brought up to the standard prevailing abroad. Private industry has co-operated in the building of new aeroplanes, although Holland, as regards aeroplane motors, remains dependent on foreign countries.

FROM OTHER SOURCES

FRANCE

June 2—Fatal Accident—Sub-Lieutenant André Quenneken, Chevalier of the Legion of Honour, fell with his machine at Villacoublay and was killed on the spot.

June 3—More Fatal Accidents—At the Aerodrome of Le Bouget, near Paris, M. Georges Lacase, brother of Admiral Lacase, Minister of Marine, was killed through the aeroplane piloted by Capt. Cotteret, whose passenger he was, catching fire in the air. Both occupants were killed instantaneously.

At Buc two machines collided at a height of 600 feet. The elevator of the machine piloted by Lieut. Poinçon de Villcharmond was carried away and the pilot killed. The other machine landed safely.

June 7—Pegoud Avenged—One of the youngest aviators in the French army, in an air fight near Mülhausen a few days ago, defeated and killed the German pilot Kandulski, who recently killed Pegoud.

June 8—Aircraft in the Verdun Struggle—The following references to the part played by aircraft in the struggle for Verdun are made by *The Times* correspondent in Paris: A series of photographs of the fort Vaux, taken at different periods by French aviators, shows with what terrific weight the German artillery bore upon the work. The successive pictures are more like microscopic slides of some terrible skin disease than photographs of skilfully and strongly constructed fortifications. In the first photographs the great band of the fortress walls of earth and masonry is clear. In the last those massive walls have made no more impression on the plate than the zigzagging lines of trenches around the position. The whole area inside the fort, seen from a height of 4,000 feet, even before the last days of unrelenting bombardment, resembles a relief map of Switzerland. On the hills and woods north and west of the position, the guns fired, not in batteries, but almost wheel against wheel. Aerial observers, unable to mark the positions of so many guns, had to content themselves with indicating the artillery regions.

June 11—French Aviator's Body Washed Ashore—The body of the French pilot Lieutenant Fr. Ch. Waddington, of Lyons, of squadron V107, has been washed ashore in Holland.

BELGIUM

June 8—Bombs on Antwerp Wharves—*Les Nouvelles*, a Belgian paper published at Maestricht, reports that a squadron of Allied aeroplanes dropped bombs on the Hoboken wharves at Antwerp, where pontoons are constructed, all being destroyed. All the aeroplanes returned without losses. Belgian aviators also dropped bombs on guns which had just been transported from Germany to Menin. Several heavy guns were destroyed and eleven German gunners wounded.

EAST AFRICA

June 8—Concealment from Aeroplanes—The captured camp (at Usambara) revealed interesting devices to conceal it from aeroplane observation. There were no tents, only grass huts of irregular outline scattered under the trees.

GERMANY

June 4—Zeppelin Scouts—The captain of the trawler *Henriette Jacoba* said that he was fishing at about 56.30 deg. N. 7 deg. E. on Wednesday (May 31) when, at about 3 o'clock, the first shots were heard coming from the north-north-west. His trawler was east of the action. He said: "The noise of the firing was at its loudest and most terrible between 5 o'clock and 6. We could hardly make ourselves heard on deck. Just then we saw two Zeppelins flying at an astonishing speed. I have seen many Zeppelins during the war, but none travelling so rapidly. It seems evident they were bringing news of the rapid approach of the British Main Fleet, as shortly after 6 the gunfire first became significantly less, but it increased again at about 7, when, I suppose, the British reinforcements arrived. After that the fighting became steadily more distant from us, and the noise died away."

June 6—Fish-shaped Zeppelin—The *Nieuwe Courant* publishes from a correspondent in Zurich a detailed description of the newly completed "super-Zeppelin" which has just been making trial trips over Lake Constance. The new airship, it is said, is specially designed for use against ships at sea. It differs materially in dimensions and construction from previous Zeppelins. It is fish-shaped, and of great length in proportion to its diameter. It has twenty-four balloonettes within the outer envelope, and four gondolas, and can carry a crew of from thirty to forty men and an enormous quantity of bombs. The motors can develop from 3,000 to 4,000 horse power, giving a maximum speed of 56 miles an hour. The steering apparatus, which differs from that of the other Zeppelins, is so perfected that the ship can turn on its own axis in half a minute, a material advantage in manœuvring over vessels provided with anti-aircraft guns. At the sides of the envelope platforms are built on which to place small guns. The airship will carry "air torpedoes" of a kind designed by a Swedish inventor, Major Junge, which can be fired a distance of nine miles. They each contain 420 lb. of explosives.

June 8—Zeppelins in the North Sea Battle—The following passage occurred in Herr Wiegand's dispatch to Washington: The statement made to Herr Wiegand by the Admiralty is that Zeppelins and submarines played no part in the battle, but that the German success was due to "the German artillery, superior marksmanship, the dash and daring of the destroyer flotillas, and the excellence of the German torpedoes, coupled with German naval strategy and tactical evolutions." It is stated that no Zeppelins were engaged in scouting on May 31, that they would have been useless because of the mist, and that they reached the scene next morning when they did valuable service. The nature of this service is not specified.

June 9—Captive Balloon's Descent—Last Friday (June 2) a captive balloon descended at Wevelghem, causing much local excitement. When the Germans rushed up they found that the balloon's car contained a straw doll with a letter in its hand and a passport for Kemmelberg, a prominent point behind Ypres. The village has been punished because too many curious people crowded up to look at the balloon.

BALKANS

June 8—Fokker Brought Down—On the right bank of the Vardar there was comparative calm to-day (June 8), but on the left the French positions were heavily bombarded this morning. French aeroplanes had an aerial combat with the enemy near the Vardar, between Karasuli and Ghevgevi, and a Fokker machine was observed to fall in the Bulgarian lines.

CASUALTIES

ROYAL NAVAL AIR SERVICE

DIED

May 31

Hodges, Flight Sub-Lieut. Leonard W., R.N.

UNOFFICIALLY REPORTED KILLED

The following appeared in the obituary columns of June 6:

Terraneau—Killed in action, on April 29, previously reported missing, Flight Sub-Lieut. Cecil Roy Terraneau, R.N. (Jack), the dearly-loved third son of Mr. and Mrs. Ernest Terraneau, of The Wharé, Twickenham, Middlesex, grandson of the late Major G. J. Stapleton, 10th Madras Native Infantry, and great-grandson of the late Lieut.-Gen. William Cotton, Indian Army, aged 21 years.
Viney, Flight Lieut. T. E., D.S.O., R.N.

Flight Lieut. Taunton Elliott Viney, D.S.O., R.N., who was reported missing on May 21, is now stated to have been killed during an air raid on Ostend on that day, at the age of 24. He was the younger son of Mr. Arthur Elliott Viney and Mrs. Viney, of Johannesburg, and Bratton, Frinton-on-Sea. He was educated at Grahamstown and at Mill Hill. He returned to South Africa at the beginning of the war and enlisted as a private in Prince Alfred's Guards, but after six months again came to England and took up a commission in the R.N. Armoured Car Section. Soon afterwards he transferred to the R.N.A.S., and quickly gained his pilot's certificate. On November 28, 1915, when accompanied by Lieut. en second de Sinçay as observer, he destroyed a German submarine off the Belgian coast by bombs dropped from an aeroplane. For this service he was awarded the D.S.O. on January 1 last, and was promoted flight-lieutenant.

DROWNED

June 9

Dickinson, Flight Lieut. Cecil W., R.N.

WOUNDED

June 1

Daly, Flight Sub-Lieut. Ivan de B., R.N.

ROYAL FLYING CORPS

UNOFFICIALLY REPORTED KILLED

June 2

Prickett, Capt. Lancelot, R.G.A. and R.F.C.

Capt. Lancelot Prickett, R.G.A. and R.F.C., aged 28, was killed in a flying accident on June 2. He was the only son of Major and Mrs. Prickett, of Worfield, Worthing.

KILLED

Powell, Second Lieut. L. C., Royal Scots Fusiliers, attached R.F.C.

DIED OF WOUNDS

Steenekamp, Second Lieut. P. A., Dragoon Guards, attached R.F.C.

PREVIOUSLY OFFICIALLY REPORTED MISSING, NOW UNOFFICIALLY REPORTED KILLED

Basden, Lieut. M. D., London Regt. and R.F.C.

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED

Glover, Second Lieut. B. E., R.F.C.

Grune, Lieut. G. D. G., R.F.A. and R.F.C.

WOUNDED

Hillman, 7766 Second Class Air Mech. A., R.F.C.

MISSING

Cairnduff, Second Lieut. A., Royal Munster Fusiliers and R.F.C.

Maxwell, Second Lieut. G., R.F.C.

Goodson, Second Lieut. A. R. L., London Regt. and R.F.C.

CORRECTION—OFFICER MISSING

Maxwell, Second Lieut. G., R.F.C. (reported missing) should read: Maxwell, Second Lieut. G. E., R.F.C.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONERS OF WAR.

Brown, Second Lieut. W. A. S., Argyll and Sutherland Highlanders and R.F.C.

Mortimer-Phelan, Lieut. W. C., R.F.C.

FATAL ACCIDENTS

Lieut. G. H. Rippon, of the Royal Flying Corps, was killed on June 7 while making a flight in a military aeroplane. At the inquest it was stated that the officer had only been in the air three minutes when he made two sharp turns, as though to get back to the aerodrome. The machine got out of control and fell to the ground, the pilot being killed instantaneously. A verdict of "Accidental death" was returned.

Lieut. Turner, of the Royal Flying Corps, was killed on June 9 in South Gloucestershire. He was returning from a flight when the machine dropped to the ground from a height of about 100 feet. The machine was wrecked and the aviator's injuries were so serious that he died shortly afterwards.

INQUESTS

J. C. CHAPMAN—An inquest was held at Hendon on May 15 on John Clifford Chapman, aged nineteen, a pupil, who met his death on May 10 as the result of a collision in the air. Chapman was making his second circuit on a Hall Caudron when his machine touched the wing-tips of a Beatty-Wright piloted by Mr. Courtenay. The two machines fell from a height of about 120 ft. Chapman was killed instantaneously, and Courtenay was badly injured. The jury returned a verdict of accidental death.

LIEUT. HAKE AND F. G. SUMNER—An inquest was held on May 16 on the bodies of Lieutenant Hake, of Bourne-mouth, and Frederick George Sumner, of Alton, Hampshire, who were killed on May 14. The evidence showed that Lieutenant Hake, after lunching with Major Berners, went up in the afternoon with Sumner to try a new machine. They flew over Major Berners's house, waving their hands to a party who were playing tennis below. Major Berners, who witnessed the accident, was of opinion that the pilot, in trying to avoid a

clump of elm trees, struck a spruce fir tree, which being old and nearly leafless, he might not have seen. The machine, after this collision, went on a short distance, avoiding a belt of trees, but crushed into some maltings and fell to the ground wrecked. Mr. Sumner fell clear and was able to take a drop or two of water which Major Berners gave him, and then expired. Lieutenant Hake was doubled up under the machine and was extricated dead ten minutes after. A verdict of accidental death was returned.

LIEUT. C. D. MERRETT—Captain Lord Lucas, of the Hampshire Yeomanry and Royal Flying Corps, had a narrow escape in an aeroplane accident on May 17. Lieutenant Charles Darrell Merrett, of the Australian Flying Corps, who was in the same machine, was killed. At the inquest on the same day Lord Lucas said he was instructing Lieutenant Merrett in a dual-control machine, and he thought that his pupil pulled the aeroplane's nose round, causing it to lose flying speed. A verdict of accidental death was returned.

An inquest was held on May 19 on the body of Richard Allen, 2nd Class Mechanic (Royal Flying Corps). The evidence showed that he was attending to a machine about to make an ascent when he was struck by the propeller and killed. A verdict of "Accidental death" was returned.

LIEUT. F. D. EVANS—A verdict of "Accidental death" was returned at an inquest at Bristol on Saturday, June 10, on the body of Lieut. Frank Dudley Evans, R.F.C., son of Mr. Albert Dudley Evans, secretary to the Birmingham Exchange, who was killed while flying near Bristol on Friday, June 9. Engine trouble caused the machine to dive, and through the loss of speed it crashed to the ground. Lieut. Evans's skull was fractured.

APPOINTMENTS

ROYAL NAVAL AIR SERVICE

Flight Commander:

T. D. Mackie, promoted to Acting Squadron Commander, with seniority of June 3.

Flight Lieut.:

J. J. Petre, promoted to Acting Flight Commander, with seniority of June 3.

To be Temp. Flight Sub-Lieut.:

R. H. Nicholson: July 19, 1915.

Temp. Sub-Lieuts. (R.N.V.R.):

H. W. Caperer, to *President*, additional, for R.N.A.S.: June 5.

R. K. J. Vallings, entered as Probationary Flight Sub-Lieut., with seniority of June 8, and appointed to *President*, for R.N.A.S.

The following have been entered as Probationary Flight Sub-Lieuts (temp.), and appointed to "President," additional, for R.N.A.S., with seniority of June 11:

R. Birks, G. M. Part, R. G. Begg, A. C. Corbett, H. Lawson, C. Boumphrey, J. W. Chuter, H. Glaisyer, P. Brend, and R. P. Minifie.

Chief Petty Officer (Mechanic):

J. Sutherland, promoted to Warrant Officer, Second Grade, with seniority of June 3.

Petty Officers Mech. (R.N.V.R.):

E. D. H. Robinson and W. J. McAlister, both promoted to Temp. Sub-Lieuts. (R.N.V.R.), with seniority of June 7, and appointed to *President*, for R.N.A.S.

Temp. commissions as Lieut. (R.N.V.R.), with seniority as follows:

Hon. W. T. Whiteley: June 4.

F. H. May, A. P. A. Larking, and W. Wright: June 5.

R. B. Freeland, entered as Probationary Flight Sub-Lieut. (temp.), with seniority of May 25, and appointed to *President*, for R.N.A.S.

The following have been granted temp. commissions as Sub-Lieuts. (R.N.V.R.), with seniority of June 8, and all appointed to "President," for R.N.A.S.:

A. F. Wilson (Probationary Flight Sub-Lieut., temp.), A. Thubra-Hardern, J. H. Dunn, W. O. Pearce, E. H. Watson, and C. H. Dennison.

ROYAL FLYING CORPS

The following appointments are made:

Major G. M. Griffith, R.A., to be Temp. Lieut.-Col. whilst employed as Assistant Director of Aeronautics in India: April 30.

Capt. C. D. M. Campbell, R.F.C., S.R., to be Temp. Major (without pay or allowances of that rank) whilst specially employed: May 18 (substituted for notification of June 3).

Flight Commanders, from Flying Officers, and to be Temp. Capts. whilst so employed:

Lieut. W. A. Summers, 18th Hussars: March 18.

Lieut. G. S. M. Ashby, R.A.: May 15.

Lieut. C. H. Dixon, Yorkshire Light Infantry, S.R.: May 17.

Lieut. C. W. E. Cole-Hamilton, Royal Scots: May 21.

Second Lieut. (Temp. Lieut.) K. T. Dowding, Royal West Surrey Regt., T.F.: May 22.

Flight Commanders, from Flying Officers:

Capt. M. G. Lee, 40th Pathans, Indian Army: May 24.

Second Lieut. C. D. Danby, Tyne Electrical Engineers, T.F., and to be Temp. Capt. whilst so employed: May 27.

Flying Officers:

Second Lieut. C. R. Clapperton, Clyde R.G.A., T.F.: April 26.

Second Lieut. F. A. Coward, Royal West Surrey Regt., and to be seconded; Temp. Second Lieut. H. G. Smart, General List; Second Lieut. W. E. Nixon, King's Own Scottish Borderers, and to be seconded: April 29.

Second Lieut. G. H. B. Streatfeild, Durham Light Infantry, S.R., and to be seconded: May 6.

Lieut. W. W. Higgin, Liverpool Regt., T.F.: May 13.

Second Lieut. A. J. Hamar, S.R.; Second Lieut. R. Buck, S.R.; Temp. Second Lieut. J. Blackwood, General List: May 14.

Temp. Second Lieut. A. M. Thom, Gordon Highlanders, and to be transferred to the General List; Second Lieut. T. Davidson, Cameron Highlanders, T.F.; Second Lieut. R. D. Clinch, S.R.; Second Lieut. D. Cloete, S.R.; Temp. Second Lieut. L. L. Richardson, General List; Temp. Second Lieut. C. E. W. Foster, General List: May 16.

Second Lieut. (Temp. Capt.) L. P. Aizlewood, York and Lancaster Regt., T.F.; Temp. Lieut. A. C. Jowett, Northumberland Fusiliers, and to be transferred to the General List; Lieut. E. G. A. Bowen, R.A., and to be seconded; Temp. Second Lieut. V. W. Harrison, Royal Fusiliers, and to be transferred to the General List; Second Lieut. G. N. Anderson, Leicestershire Yeomanry, T.F.; Second Lieut. (on probation) S. C. T. Littlewood, North Lancashire Regt., S.R., and to be seconded; Temp. Second Lieut. H. Meintjes, General List; Second Lieut. G. L. Faulkner, S.R.; Second Lieut. D. G. B. Jardine, Highland Light Infantry, and to be seconded; Second Lieut. C. St. G. Campbell, S.R.; Second Lieut. L. G. Wood, Devonshire Regt., and to be seconded: May 17.

Temp. Second Lieut. R. C. Bryant, Royal West Surrey Regt., and to be transferred to the General List; Second Lieut. (on probation) V. L. Anderson, Argyll and Sutherland Highlanders, S.R., and to be seconded; G. H. Armstrong, R. M. W. Browne, H. B. Prior; Second Lieut. H. G. Monks, I.A. Reserve of Officers; Second Lieut. W. O. Crowe, S.R.; Second Lieut. W. R. Snow, S.R.; Second Lieut. B. D. Frost, Essex Regt., and to be seconded: May 18.

Capt. R. H. Freeman, Worcestershire Regt., S.R., and to be seconded; Temp. Second Lieut. H. T. Horsfield, attached Worcestershire Regt., and to be transferred to General List; Temp. Second Lieut. R. S. Haward, Middlesex Regt., and to be transferred to General List; Temp. Second Lieut. G. K. Palmer, East Surrey Regt., and to be transferred to General List; Temp. Second Lieut. W. Sowrey, Royal Berkshire Regt., and to be transferred to General List; Temp. Second Lieut. E. J. L. W. Gilchrist, Reserve Regts. of Cavalry, and to be transferred to General List; Temp. Lieut. K. S. Henderson, General List; Second Lieut. F. L. J. Shirley, Yorkshire Regt., and to be seconded; Second Lieut. M. H. Turner, Dorset Regt., S.R., and to be seconded: May 19.

Temp. Second Lieut. F. S. Moller, Royal Fusiliers, and to be transferred to General List; Temp. Second Lieut. E. R. Atkinson, Gloucestershire Regt., and to be transferred to General List; Second Lieut. M. R. N. Jennings, S.R.: May 20.

Flying Officers, from Flying Officers (Observers):

Capt. A. A. Walser, London Regt., T.F.: April 26.

Temp. Second Lieut. K. F. Balmain, General List: May 6.

Temp. Second Lieut. J. McArthur, General List; Lieut. G. C. de Dombasle, Royal Canadian Regt.; Second Lieut. T. Henderson, Tyne Electrical Engineers, T.F.: May 16.

Lieut. J. S. B. MacPherson, Canadian Artillery: May 19.

Flying Officer (Observer):

Lieut. M. D. G. Scott, North Lancashire Regt., S.R., and to be seconded: May 21.

SPECIAL RESERVE

Lieut. G. de Havilland to be Capt.: April 30.

The following Second Lieuts. (on probation) are confirmed in their rank:

R. D. Clinch, C. Jarrott, J. E. Appleyard.

M. R. N. Jennings, W. O. Crowe, R. S. Carroll, A. R. Thomas, W. R. Snow: May 20.

L. I. T. Hewer, J. W. James, H. F. Fisher, J. A. Brown, the Hon. M. Greville.

To be Second Lieuts. (on probation):

R. N. Rowell: April 19.

E. G. A. Lefrere: April 24.

J. H. Robertson: April 25.

H. H. W. Vowden: May 3.

F. M. Iredale: May 8.

C. G. H. Winter: May 27.

To be Second Lieut.:

T. C. Thrupp: May 20.

Second Lieut. (on probation) W. F. Sullivan relinquishes his commission: May 13.

AERONAUTICS

A WEEKLY JOURNAL DEVOTED TO THE TECHNIQUE OF AERONAUTICS

(FOUNDED 1907)

Edited by JOHN H. LEDEBOER, B.A., A.F.Ae.S.

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JUNE 21, 1916

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as a Newspaper]

ONE PENNY

SOME PREVAILING MISCONCEPTIONS

AN extraordinary amount of misconception still seems to prevail, even in the minds of otherwise well-balanced writers, regarding the functions and limitations of the recently-created Air Board as contrasted with the scope of a fully-fledged Air Ministry. That with the progress of aerial science the creation of an Air Ministry at some future time is a virtual certainty is a fact now accepted by most; that the institution of such an Air Ministry—and by that term I do not necessarily mean a Government Department presided over by a Cabinet Minister, but simply an Air Board invested with executive powers—will entail as its corollary the formation of a single independent and homogeneous Air Service is fairly self-evident. For the last four years, in these columns and elsewhere, I have strongly urged the necessity for these twin developments, though perhaps somewhat prematurely; but the outbreak and continuance of the war rendered the immediate carrying into execution of the project practically impossible, at any rate in so far as the separate Air Service was concerned. If therefore I return to the subject at the present time, it is simply to refute a whole series of misconceptions which have recently been given currency, not only by irresponsible writers in the Press, but also by some who may justly be regarded as authorities.

* * *

Among the ranks of the latter Mr. F. W. Lanchester may be given pride of place. Mr. Lanchester is an engineer and mathematician of repute, who has lately made a curious incursion into the realms of strategy and tactics with the laudable ambition to reduce these ancient and complex sciences to the limits of a simple elementary mathematical formula. No one would venture to dispute Mr. Lanchester's transcendent abilities in his own particular sphere; in the matter of phugoid curves and such like his authority, no doubt, would be hard to challenge; but as an expert on military strategy and organisation he has yet to make his mark. His recent utterances on the case for an Air Ministry scarcely inspire confidence for his brilliant future in this respect.

* * *

We will allow him to state his own case in the inimitable dogmatic fashion peculiar to the mathematician. He writes:

"It is at the outset necessary to insist on the fundamental distinction between operations of direct and of *indirect* military value; it is precisely on this point, and it is definitely on the future of potential value of operations of indirect military value that the case for an Air Ministry will stand or fall. If no such operations were feasible or, from a strategic point of view, desirable, then there is no case for an Air Ministry. If, on the other hand, it can be shown that operations of indirect value are destined to become of importance, then there is a case for an Air Ministry and for an independent Air Service, and the more important the

operations of indirect military value become, the stronger the case."

* * *

A word of explanation may not be out of place. Mr. Lanchester classifies military operations into those possessing *direct* military value and those to which he concedes merely *indirect* value. The former are such measures as are intimately concerned with a definite objective attempted and thus forming an integral part of a single cohesive operation, as witness the bombing operations on railway junctions behind the hostile line carried out during a great advance with the sole and immediate object of interfering with the enemy's communications and preventing him from bringing up reinforcements to a threatened sector. As possessing merely *indirect* military value, he characterises those operations which, though in general aimed at inflicting hurt upon the enemy, are yet carried out without relation to any definite co-ordinated and strictly circumscribed strategical or tactical scheme. To this order belong the Friedrichshafen raids (Mr. Lanchester may incidentally be reminded of the fact that the French also attempted one) and that on Karlsruhe (which he failed to mention). Giving different and more readily comprehensible values to the terms of his formula, Mr. Lanchester, in effect, strives to imply that the whole case of an Air Ministry, or its equivalent, an Air Board possessing executive and administrative powers, rests entirely or falls with the necessity, or otherwise for long-distance raids only indirectly connected with active military operations.

* * *

Such a view is surely only an illustration of the limitations of the mathematical mind, intent solely upon making facts fit the mould of a pre-ordained formula. To the ordinary student of such matters it would seem that long-distance raids only play a very minor part in any concerted scheme of military operations as we know them to-day. In fact, raids of this order, with all their uncertainty of execution, are precisely similar to the long-distance and spasmodic bombardments carried out by the Germans with the aid of long-range guns on Dunkirk or Nancy. But surely no artillery officer would advocate the establishment of an Artillery Ministry because such bombardments have been proved feasible and attended with some success? Or take another instance. The raid on Cuxhaven or on the airship stations on the Schleswig coast—were they direct or indirect in their potential value? These raids were made by the R.N.A.S. with a view to destroying hostile scouts, just as the Navy would attempt to destroy an enemy torpedo-boat in its harbour if it had the chance. The fact that the raid on Friedrichshafen was made by the R.N.A.S. is wholly beside the point; this was simply because the R.F.C. was fully occupied elsewhere and could spare neither men nor machines for the purpose. In fact, the unbiassed and non-mathematical observer would adduce the Friedrichshafen raid as one of the most glaring instances that have yet come into view of the

necessity for creating a single air service, without invoking the aid of pure logic to determine whether such a venture ought by right and prerogative to be comprised within the legitimate sphere of action of the R.F.C. or the R.N.A.S. Mr. Lanchester, it is to be feared, would like to see every military operation docketed, labelled, properly indexed, and deposited in its own hermetically sealed pigeon-hole.

The point at issue can be set forth quite simply. Mr. Lanchester envisages an Air Ministry as a Government department invested with supreme executive powers, living side by side and on equal terms with the Navy and the Army, in unchallenged control of aerial strategy. The existing Air Board, which he upholds, on the other hand, devoid of any executive power, providing as it does merely a possible channel—to be used as rarely as possible and only in case of absolute necessity—for an exchange of views between the nominal representatives of the two separate and divided air services and the War Committee, is to be used to perpetuate the existing system of disunion and divided control.

Mr. Lanchester's mathematics have proved too much for his common sense. Nobody possessing any knowledge of the conditions of aerial warfare with which we are familiar to-day dreams for a moment that long-distance raids possess any intrinsic and direct military value; no one, save Mr. Lanchester, would deem the case for an Air Ministry

contingent upon their value. They are mere incidents in the general scheme of military operations, no more important and no less than the naval gun which threw a shell or two into Dunkirk or the nightly Zeppelin excursions over the English coast.

* * *

The case for an Air Ministry, or for an Air Board, possessing executive and administrative powers—that is the whole crux—rests upon quite different foundations. It is required not to dictate the employment of air craft, but to supply them with the personnel to man them, to introduce a controlling hand in the direction of aerial operations in accordance with the momentary requirements of the naval and military commanders, and to prevent the waste of effort and over'lapping inevitable so long as the present system—which seeks to make the R.N.A.S. an appanage of the Navy and the R.F.C. ancillary to the Army—endures. The strategy of the matter may safely be left to the two commanders-in-chief or to the War Committee, as it had to be in the case of Gallipoli. By the way, no doubt Mr. Lanchester will prepare for our edification a new formula to determine whether the Air Service in that case ought to have been provided by the Navy or the Army. Like Rosa Dartle, I am simply asking for information.

J. H. L.



INSTRUCTOR C. M. HILL WITH SOME OF HIS PUPILS ON THE 70 H P. ISAACSON ENGINE CAUDRON AT THE HALL SCHOOL. ENGLISH BUILT AEROPLANE, PROPELLER (EBORA) AND ENGINE.

SPECIFICATION FOR MILITARY AEROPLANES

APRIL 24, 1916

(Continued from page 395)

VI. INSPECTION AT FACTORY DURING CONSTRUCTION: One or more designated representatives of the Government will be present at the factory during the construction of aeroplanes ordered. These representatives will be present in the capacity of inspectors, and will observe the following points, and such others as they may deem advisable:

That the constructors provide the proper strength of construction and the proper quality of material and grade of workmanship for each machine; that they make satisfactory provisions against deterioration of structural and other parts due to wear, vibration, and the action of salt water and moist air, varying climatic conditions, etc.

To determine that the constructors have an efficient system of expert inspection to insure the above qualities.

That all details of construction conform to the best proved and approved practice.

To require such tests of material or of assembled or component parts as is deemed necessary, and observe such tests.

To reject any unsatisfactory part at any time during the construction of any machine at the factory.

To require supplementary tests as desired of materials and parts when deemed advisable.

To see that steel used in construction will be of such a grade as to have high resistance to crystallisation due to vibration.

The use of such other materials as have not been proved by test or experience to be non-subject to crystallisation due to vibration will be discouraged.

To see that provisions for the protection of metal parts, and adjoining wooden parts, against the corroding action of salt water and moist air are satisfactory.

If laminated wood parts be used, to see that provisions for protecting them against the action of salt water, vibration, etc., are satisfactory. Particular care shall have been exercised to prevent access of moisture at faying surfaces, to end grain butts, scarfs, and joints, and such protection must be applied before the final assembly of parts.

To see that the threads of all bolts and nuts used in the construction conform to the U.S. standard, except where castle nuts are used, when the threads shall be of the S.A.E. standard. Pipe threads will conform to the Briggs standard.

Interchangeability of parts, assembled and component, fittings, etc., will be considered desirable, but this attribute should not interfere with others.

The main landing wheels will be of sturdy construction, have tangential spokes, and be not less than 24 inches in diameter, or less than 4 inches in tyre width.

The wheel tread should be between 0.13 and 0.19 of the spread of the lower wing.

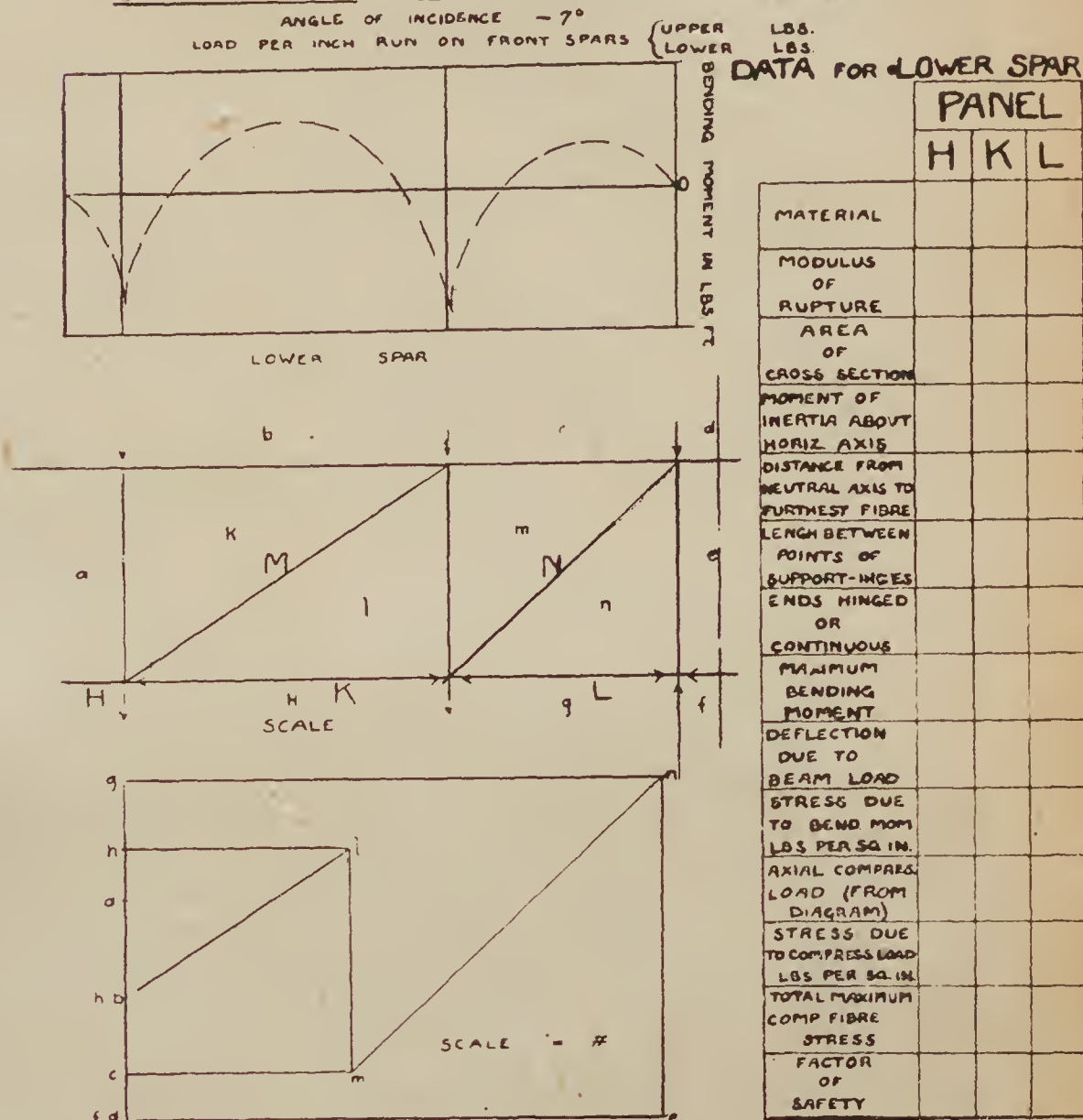
The wing covering to be of the best grade of raw linen, of weight not less than 3.75 ounces per square yard. The method of covering the wing to be such as to render the cloth of the proper tautness, smoothness, and security. Holes about 3/16 of an inch in diameter with rust-proof eyelets shall be placed between each rib, near the inner rib in each case, on the lower surface of the wing, about 1.5 inches from the trailing edge.

The colour scheme will be as nearly white as practicable, using standard dopes and varnishes.

Stranded steel cable will be used for all tension members which are readily accessible for adjustment, and for all control leads.

All cables which are members of the wing structure and nor-

STRESSES IN FORWARD SYSTEM



DATA FOR STRUTS

SYMBOL	MATERIAL	MODULUS OF RUPTURE	AREA OF CROSS SECTION (MIDDLE)	TAPER OF AREA	LEAST RADIUS OF GYRATION	LENGTH INCHES	COMPRESS. LOAD (DIAGRAM)	STRESS LBS. PER SQ. IN.	FACTOR OF SAFETY
D									
E									

DATA FOR WIRES

SYMBOL	NUMBER OF WIRES	MATERIAL	DIAMETER	ELASTIC LIMIT	BREAKING LOAD	LOAD (DIAGRAM)	FACTOR OF SAFETY

SHEET 5

mally under tensile load in flight will be in duplicate, and made independent between fittings.

All control cables will be in duplicate, each wire being independent of all others, and isolated from all others as much as is practicable, between control columns and surface yokes.

Satisfactory provisions will be made, as far as it is practicable, for convenient and thorough inspection of control cables and pulleys and vital structural members. The material and method of tipping propellers will be such as to insure protection against the action of sand, as well as to render the tips secure in place.

All gasoline tubing to be satisfactory as to flexibility, durability, impenetrability, and to have been tested for leaks after vibration.

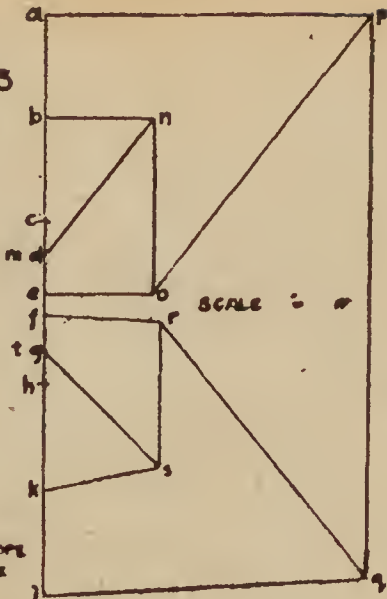
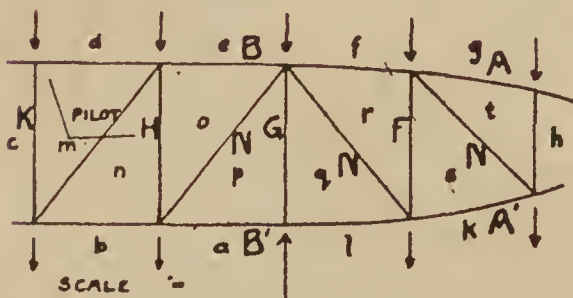
Gasoline leads to reserve tanks, the control leads, and the carburettor adjusting rod shall be provided with suitable, safe, and readily accessible couplings.

The gasoline tanks, oil, and water reserves shall be of sufficient

STRESSES IN BODY STRUCTURE

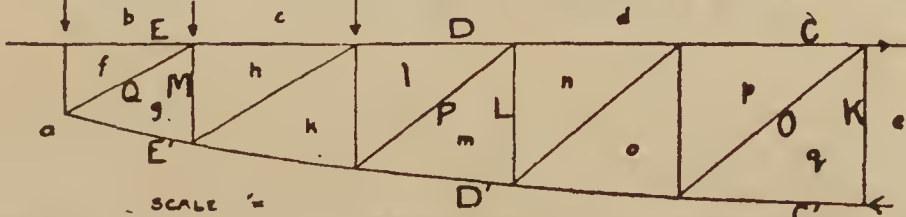
LOADS INDICATED ARE FOR ONE SIDE OF TRUSS ONLY

DIAGRAM FOR THRUST FROM CHASSIS STRUTS IN HARD LANDING

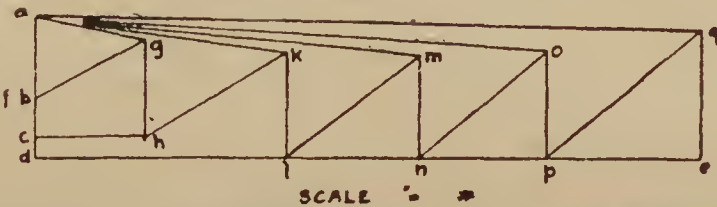


THRUST OF CHASSIS STRUT LBS. THIS THRUST WILL OCCUR WHEN THE MACHINE LANDS SLIDING ON A SLOPE OF ONE IN WITH A SPEED OF MILES AN HOUR, LBS. OF THE SHOCK BEING ABSORBED WITHIN THE CHASSIS.

DIAGRAM FOR AIR LOADS ON HORIZONTAL TAIL



THESE LOADS WILL OCCUR WHEN THE ELEVATORS, TOTAL AREA 55. FT., HAVE AN ANGLE OF INCIDENCE °, AND THE FIXED SURFACE AREA 55. FT. AN ANGLE OF °, THE AIR SPEED BEING MILES AN HOUR.



DATA FOR LONGITUDINALS AND STRUTS

SECTIONS OF LONGITUDINALS BETWEEN POINTS OF SUPPORT HAVE BEEN CONSIDERED AS STRUTS FIXED IN DIRECTION AT BOTH ENDS.

STRUTS ARE NOT HELD AT FIXED ANGLES TO LONGITUDINALS AND HAVE BEEN CONSIDERED AS COLUMNS HINGED AT BOTH ENDS.

THE LINE OF TENSION OF EACH WIRE PASSES THRU THE INTERSECTION OF THE NEUTRAL AXIS OF THE LONGITUDINAL WITH THE AXIS OF THE STRUT.

SYMBOL	MATERIAL	MODULUS OF RUPTURE	AREA OF CROSS SECTION	LEAST RADIUS OF GYRATION	LENGTH BETWEEN POINTS OF SUPPORT	TENSILE LOAD	COMPRESSIVE LOAD	MAXIMUM STRESS LBS PER SQ IN.	FACTOR OF SAFETY
A									
A'									
B									
B'									
C									
C'									
D									
D'									
E									
E'									
F									
G									
H									
K									
L									
M									

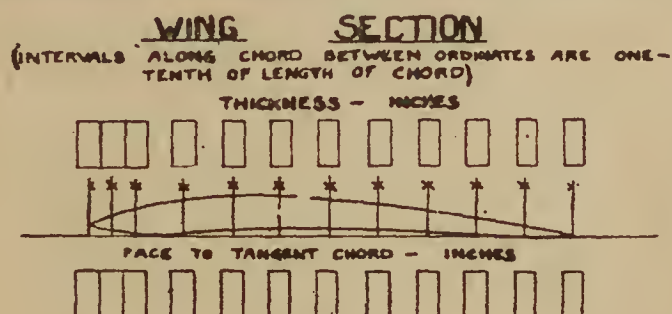
DATA FOR WIRES

SYMBOL	NUMBER OF WIRES	MATERIAL	DIAMETER	ELASTIC LIMIT	BREAKING LOAD	INDICATED LOAD	FACTOR OF SAFETY
N							
O							
P							
Q							

PERFORMANCE

WEIGHTS		LBS.
Body	ENGINE FRAMES	
	FORWARD LONGERONS	
	FORWARD VERTICAL STRUTS	
	FORWARD HORIZONTAL STRUTS	
	REAR LONGERONS	
	REAR VERTICAL STRUTS	
	REAR HORIZONTAL STRUTS	
	FITTINGS	
	WIRING AND TURNBUCKLES	
	BODY STRUCTURE	
	COWLING, FABRIC, AND FRAME	
	GASOLINE TANKS	
	OIL TANK	
	SEATS AND BRACES	
	CONTROL COMPLETE	
	MOTOR	
	RADIATOR AND WATER	
	PROPELLER AND BOSS BOLTS	
	INSTRUMENTS	
	BODY EMPTY COMPLETE	
Chassis	STRUTS	
	AXLES	
	SKIDS	
	AXLE BRACES	
	WHEELS	
	AXLE MOUNTINGS AND GUIDES	
Wing	RUBBER BRACELETS, FITTINGS, WIRE AND TURNBUCKLES	
	CHASSIS COMPLETE	
	FRONT SPARS - FULL SPAN	
	REAR SPARS - FULL SPAN	
	SOLID RIBS	
	LIGHTENED RIBS	
	ENTERING AND TRAILING EDGE PIECES AND LOCAL BRACING	
	FITTINGS, WIRING AND TURNBUCKLES	
	WING SKELETONS	
	FABRIC AND DOPE	
Tail	INTERPLANE STRUTS	
	STRUT SOCKETS AND BOLTS	
	AILERONS, YOKES AND PULLEYS	
	INTERPLANE WIRING AND TURNBUCKLES	
	WINGS COMPLETE	
Machine	TAIL, COMPLETE, ELEVATORS, RUDDER BRACING AND YOKES	
	MACHINE COMPLETE EMPTY	

ESTIMATE OF PARASITE RESISTANCE		
ITEM		RESISTANCE IN LBS. DIVIDED BY TOTAL LENGTH, SURFACE AREA, PROJECTED AREA V^2 , (AIR SPEED IN FEET/HR OR MILES/HR)
Body	BODY - BARE	
	RADIATOR	
	WHEELS	
	TAIL SURFACES	
Chassis	TAIL APPENDAGES AND WIRING	
	WHEELS	
	AXLES AND HORIZONTAL DISTANCE PIECES	
	STRUTS	
	SKIDS	
	SHOCK ABSORBERS AND AXLE MOUNTINGS	
Wing	WIRING AND TURNBUCKLES	
	FITTINGS	
	INTER-PLANE STRUTS	
	INTER-PLANE WIRING	
	TURNBUCKLES AND SPACED EYES	
	STRUT SOCKETS, BOLTS AND FITTINGS	
Surfaces	SURFACES	
	APPENDAGES	
	CONTROL WIRES AND PULLEYS	



SHEET 7

capacity to permit of a flight of at least six hours' duration in hot weather with motor turning at the number of revolutions per minute required for its full rated power.

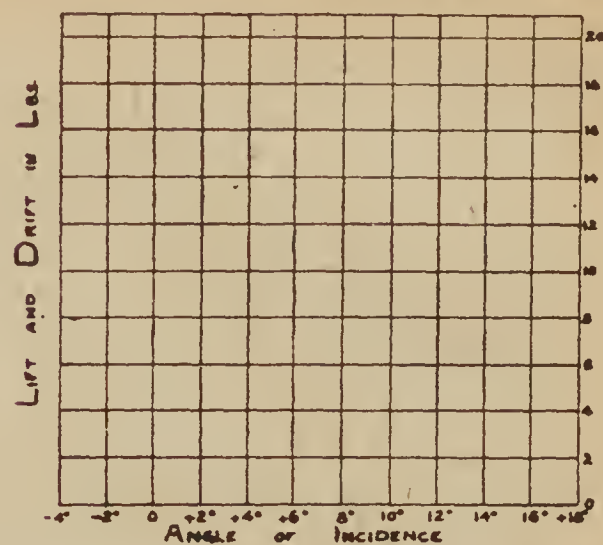
It will be considered desirable to have provision in the gasoline tank system for reducing to a minimum loss of gasoline due to bullet holes.

Fuel tanks which may in service be subjected to internal

FORCES ON MODEL OF WING ALONE

EXACT RESULTS OF WIND TUNNEL TESTS

SPAN OF MODEL INCHES CHORD OF MODEL INCHES
SPEED OF WIND MI/HR DENSITY OF AIR LBS./CU.F



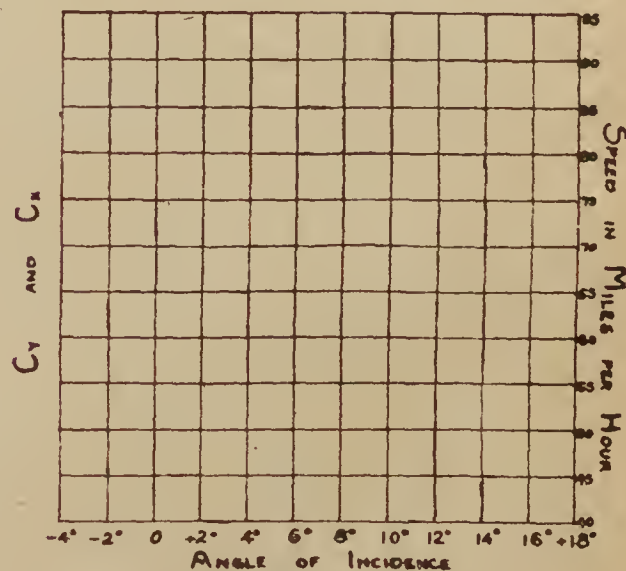
FACTORS USED IN REDUCING WING EFFICIENCY FROM THAT OF MODEL SINGLE PLANE TO THAT ON FINAL MACHINE - ANGLE OF INCIDENCE $+8^\circ$

	FULL SIZE AND SPEED	ASPECT RATIO	BIPLANE INTERFERENCE	STAGGER	DECALAGE	RESONANT
AMOUNT OF CHANGE						
FACTOR FOR LIFT C_L						
FACTOR FOR DRIFT C_D						

FORCE COEFFICIENTS AND SPEEDS OF COMPLETE FULL-SCALE AEROPLANE

$$C_L = \frac{\text{LIFT TOTAL (LBS)}}{V^2 (\text{MI/HR})} \quad C_D = \frac{\text{DRIFT TOTAL (LBS)}}{V^2 (\text{MI/HR})}$$

ANGLE OF INCIDENCE FOR REQUIRED LIFT AT VARIOUS SPEEDS
SPEED CURVE NO. 1 - FULL LOAD; NO. 2 - LIGHT LOAD



BEST GLIDING ANGLE:
FULL LOAD - 1 IN AT $^\circ$ INCIDENCE, AT MI/HR
LIGHT LOAD - 1 IN AT $^\circ$ INCIDENCE, AT MI/HR

SHEET 7 (continued)

pressure will be of sufficient strength to withstand an internal pressure of at least 6 pounds per square inch. Wherever necessary fuel tanks will be divided by the proper number of swash plate bulkheads.

The radiator will be of approved design and so constructed as to be proof against the action of vibration.

The inspector will be prepared to submit, ten days before the contract date of delivery of the first machine of the group ordered, a proper, complete, itemised list of the spare parts required for the equipment ordered, and the nature of service designated. The list will include itemised cost.

At the request of one of the inspectors the contractor shall furnish the inspector the following:

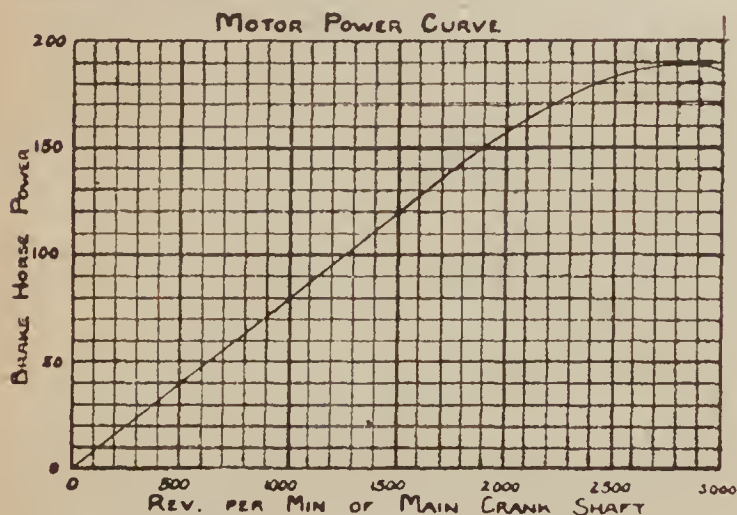
Data which will show the capacity of the factory and affiliated factories, and the standing and responsibility of the firm.

Drawings pertaining to the construction of the aeroplanes being supplied.

Authenticated data from wind tunnel tests on an exact model of one of these machines, made to a suitable scale, as follows: Pitching moments (force vectors being plotted), at angles of incidence (mean chord, main planes) from minus 9 degrees to plus 24 degrees, observations taken every 3 degrees, and in

POWER AND PERFORMANCEMOTOR

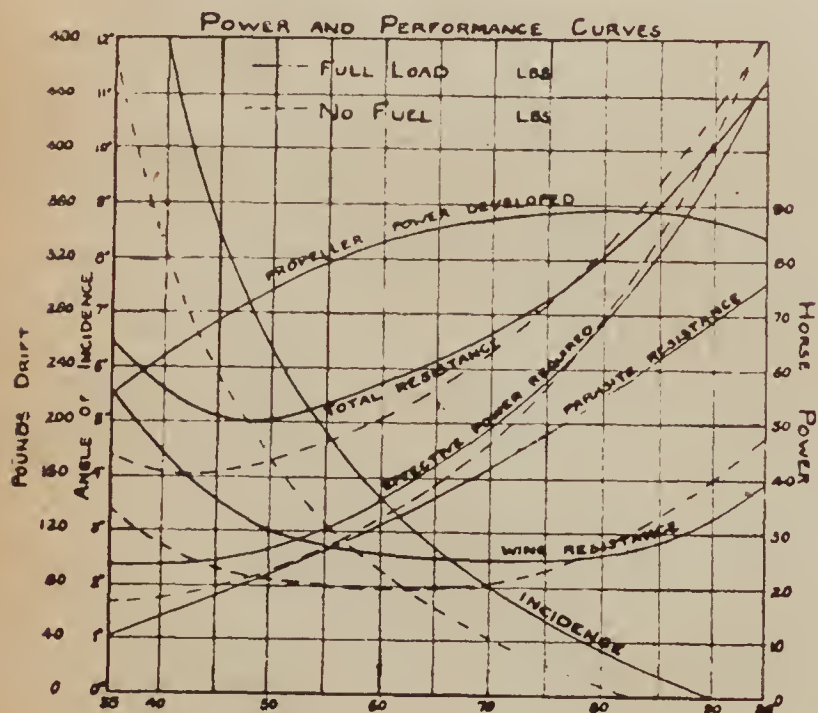
TYPE
 NUMBER OF CYLINDERS
 COOLING
 POUNDS PER HORSE POWER
 GASOLINE CONSUMPTION POUNDS PER HORSE POWER HOUR
 OIL CONSUMPTION POUNDS PER HORSE POWER HOUR
 FUEL CONSUMPTION POUNDS PER HORSE POWER HOUR
 WEIGHT, INCLUDING MAGNETO AND CARBURETTER
 CENTER OF GRAVITY AS ABOVE ABOUT REAR EDGE OF PROPELLER
 WEIGHT OF RADIATOR
 WEIGHT OF WATER



METHOD OF MEASURING THE BRAKE HORSE POWER

PROPELLER

NUMBER OF BLADES
 DIAMETER
 MEAN PITCH OF FACE
 MEAN BLADE WIDTH
 MAXIMUM EFFICIENCY (MI/HR)
 REV PER MIN (EFFICIENCY AT 35 MI/HR)
 (EFFICIENCY AT 40 MI/HR)



USING PROPELLER DESIGNED FOR HIGH SPEED THROUGHOUT.

MAXIMUM HORIZONTAL SPEED FROM POWER AVAILABLE MILES PER HOUR
 MINIMUM SPEED, TWO MEN, NO FUEL, 12° INCIDENCE MILES PER HOUR
 MAXIMUM SPEED, NO FUEL MILES PER HOUR
 MINIMUM SPEED, FULL LOAD 12° INCIDENCE MILES PER HOUR
 MAXIMUM CLIMB, TWO MEN, NO FUEL FEET PER MIN
 HORIZONTAL AIR SPEED FOR MAXIMUM CLIMB NO FUEL MILES PER HOUR
 MAXIMUM INITIAL CLIMB, FULL LOAD, FEET PER MIN.
 HORIZONTAL AIR SPEED FOR MAXIMUM CLIMB FULL LOAD MILES PER HOUR
 HORIZONTAL AIR SPEED FOR BEST GLIDE FULL LOAD MILES PER HOUR
 HORIZONTAL AIR SPEED FOR BEST GLIDE NO FUEL MILES PER HOUR
 MINIMUM BRAKE HORSE POWER REQUIRED, FULL LOAD
 SPEED OF MINIMUM POWER FULL LOAD MILES PER HOUR
 MINIMUM BRAKE HORSE POWER REQUIRED, NO FUEL
 SPEED OF MINIMUM POWER NO FUEL MILES PER HOUR

ENDURANCE FULL POWER { MILES RADIUS
 HOURS DURATION
 MILES PER HOUR SPEED
 ENDURANCE MINIMUM POWER { MILES RADIUS
 HOURS DURATION
 MILES PER HOUR AVERAGE SPEED
 ENDURANCE ECONOMICAL SPEED { MILES RADIUS
 HOURS DURATION
 MILES PER HOUR INITIAL SPEED
 MILES PER HOUR FINAL SPEED

SHEET 8

STABILITY

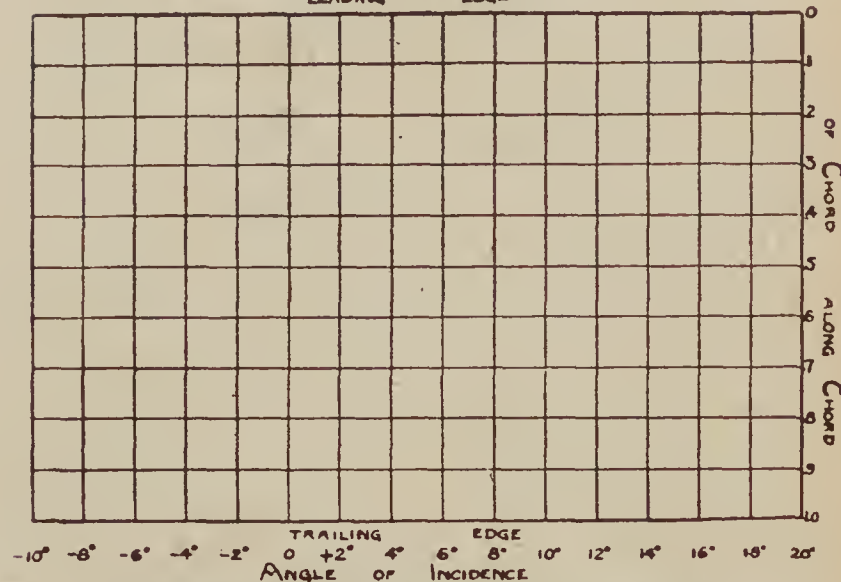
EXACT RESULTS OF WIND TUNNEL TESTS ON MODEL OF WING ALONE AND ON
 MODEL OF COMPLETE MACHINE
 MODEL OF COMPLETE MACHINE - SCALE " " ; WIND VELOCITY MI/HR;
 DENSITY OF AIR LBS/CUFT.
 ALL AXES PASS THRU CENTER OF GRAVITY OF FINAL FULL-SCALE MACHINE

SIGN CONVENTIONS

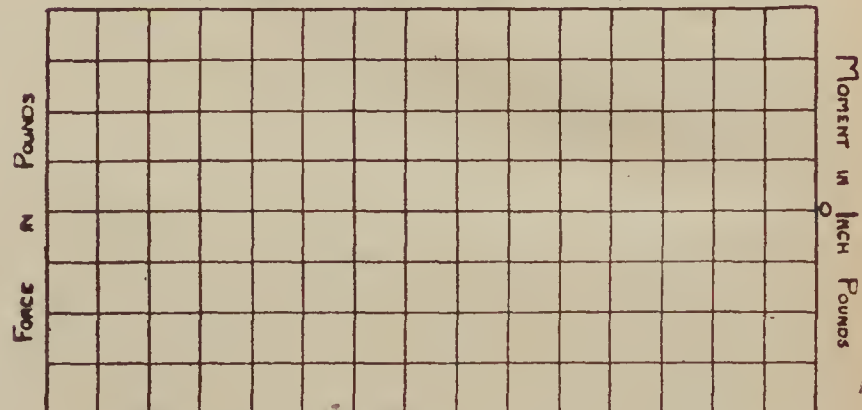
POSITIVE (ABOVE ZERO LINE) { STALLING
 ROLL AUGMENTED
 NOSE TURNS FROM WIND

PITCHING MOMENTS TAKEN AT 0 ANGLE OF YAW
 CROSS-WIND FORCES TAKEN WITH MEAN ANGLE OF INCIDENCE

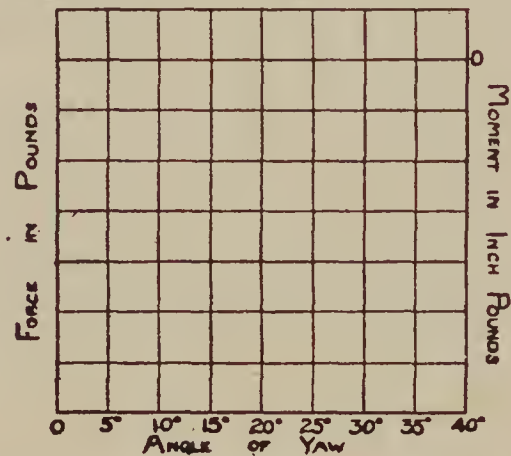
CENTER OF PRESSURE OF WING ALONE
 LEADING EDGE TRAILING EDGE

MODEL OF COMPLETE MACHINE

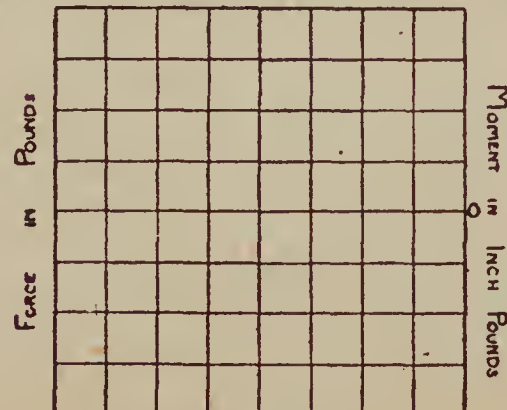
PITCHING MOMENTS AND FORCES AT ANGLES OF PITCH



ROLLING MOMENTS AND FORCES DUE TO CROSS-WIND



YAWING MOMENTS AND FORCES DUE TO CROSS-WIND



SHEET 9

AUXILIARY SURFACES

SURFACES	FULL-SCALE MACHINE					
	AREA SQ. FT.	ASPECT RATIO	ARM-PROPELLER CENTER OF DIVIDED BY PRESSURE V^2 (AIR C.G. MACHINE) SPEED-PLANE	ANGLE FROM TO MEAN CHORD OF PLANES PER HOUR	ANGLE FROM TO MEAN CHORD OF PLANES PER HOUR	MOMENT LBS. FT. → V^2 (MILES PER HOUR
WINGS - TOTAL						
FIXED HORIZONTAL TAIL						
ELEVATORS - TOTAL						
FIXED VERTICAL FIN						
VERTICAL RUDDER						

MAIN PLANES

	FULL-SCALE MACHINE	
	UPPER WING	LOWER WING
SPAN		
CHORD		
DECALAGE		
DIHEDRAL		
RETREAT		

CENTER OF GRAVITY ABAFT PROPELLER. (FULL LOAD)
 CENTER OF GRAVITY ABAFT PROPELLER (2 MEN, NO FUEL)
 SAFE FORWARD LIMIT OF CENTER OF GRAVITY ABAFT THE PROPELLER
 (FULL LOAD)
 SAFE REAR LIMIT OF CENTER OF GRAVITY ABAFT THE PROPELLER
 (FULL LOAD)
 SAFE FORWARD LIMIT OF CENTER OF GRAVITY ABAFT THE PROPELLER
 (2 MEN, NO FUEL)
 SAFE REAR LIMIT OF CENTER OF GRAVITY ABAFT THE PROPELLER
 (2 MEN, NO FUEL)
 CENTER OF GRAVITY ABOVE PROPELLER AXIS (FULL LOAD)
 CENTER OF GRAVITY ABOVE PROPELLER AXIS (2 MEN, NO FUEL)
 RADIUS OF GYRATION {
 KX
 KY
 KZ

SHEET 9 (continued)

addition at the following angles: minus 2 degrees, minus 1 degree, plus 1 degree, and plus 2 degrees. The model shall have movable elevator surfaces cut off for the tests.

Data showing the elastic limit, hardness, and other important physical characteristics from authenticated records of tests on the exact steels (exact including final heat treatment, if any) used in the construction of the various parts.

Reliable historical information regarding the origin and time and method of seasoning of the material for wooden parts.

Records of tests of glue, cement, shellac, varnish, or dope when required; such tests should comprise alternately soaking in salt water and drying, etc.

Three complete sets of factory working drawings of the complete aeroplanes, for transmittal as desired by the Chief Signal Officer of the Army.

All data, drawings, and information furnished by a contractor to an inspector is to be treated as strictly confidential and shall be imparted only to officials of the War Department.

In the event of a decided disagreement between inspector and manufacturer on a point which involves considerable expense on the part of the manufacturer in order to effect the change required by the inspector's suggestion, the matter will be referred to the Chief Signal Officer of the Army for decision.

Inspectors and their assistants will be given free access at all times during the manufacture of aeroplanes or parts thereof being constructed in accordance with this specification, to any and all parts of the factory in which a part of the aeroplane is handled.

Acceptance of an order under this specification shall signify that the contractor agrees to all of the provisions of this specification, and that the true intent and purpose of these provisions will be adhered to.

Office of the Chief Signal Officer of the Army,
 April 24, 1916.

PROGRESS OF AMERICAN AVIATION

By ERNEST L. JONES, American Editor

REGULAR NAVY TO TRAIN NAVAL MILITIA

WITH regard to the training of officers and men at Pensacola Aeronautic Station, the following announcement has lately been issued:—

The Navy Department has adopted the following policy in regard to line officers (Aeronautic Duties Only) and enlisted men (Aeronautic Branch):

- (a) Line officers (Aeronautic Duties Only) and enlisted men (Aeronautic Branch) of the aeronautic sections and divisions may be instructed in flying, and officers and enlisted men (in limited numbers) will be sent to the Naval Aeronautic Station, Pensacola, Florida, for training.

Note.—At present the facilities of the Station are such as to preclude the possibility of training enlisted men of the Naval Militia. It is, however, the intention of the Department to take up this training at the earliest practicable date.

- (b) No officer or enlisted man who has not a certificate of eligibility as a flyer will be sent to Pensacola for shorter period than six weeks. Officers and enlisted men holding certificates of ability as flyers may be sent to Pensacola for periods not less than four weeks.
- (c) No officer or enlisted man will be sent to Pensacola for training unless he possesses a sufficient preliminary education that will enable him to obtain the full benefits of the training.

NAVAL APPROPRIATION

THE sub-committee of the House Committee on Naval Affairs has reported to the whole committee a tentative Naval Appropriation Bill.

Under the provisions of the Bill as agreed to by the sub-committee a plan is provided for the reorganization and enlargement of the aviation service. The sub-committee provides for this not only by large appropriations, but by the creation of a Navy flying corps, which is to consist of 150 officers and enlisted men. There are to be five flight commanders, one of whom is to be the senior flight commander. The other officers of the Navy flying corps will be ten flight lieutenant commanders, thirty flight lieutenants, thirty flight lieutenants junior grade, and twenty-five flight ensigns.

The enlisted personnel of the flying corps will consist of ten chief warrant officers with the rank of chief machinist, and fifteen warrant officers with the rank of machinist. An appropriation of \$2,000,000 (£400,000) is made under the head of aviation. In addition to this an appropriation of \$85,000 is made for the Naval Advisory Council for aeronautics.

The General Board advised \$5,000,000 for aeronautics for 1916, but Congressional experts have cut it down to this \$2,000,000. The General Board also disapproved of the proposed "Naval Flying Corps."

A grade of student flyers is created who, while undergoing instructions receive the same pay and allowances as midshipmen. An enlisted man who passes a satisfactory examination is eligible to appointment as a student flyer. Practically no restrictions are placed upon the authority of the President to appoint student flyers or commission civilians in the flying corps for the first two years. Evidently it is the purpose of the provision to fill up the corps from civilian aviators.

There will be opposition to this when it comes up before the whole committee, as civilians are given the same rank in the Navy that line officers who are graduates of Annapolis receive. Two years after the passage of the Act vacancies in the naval flying corps may be filled by Navy and Marine Corps officers. The transfers from the Navy and Marine Corps are limited to not more than one commander, two lieutenant commanders, five lieutenants, and five lieutenants junior grades in one year. The secretary is authorized to establish an aeronautical school for the instruction of student flyers. Student flyers who take the course at the school are eligible for commissions in the flying corps.

An appropriation of \$250,000 is also made for the San Diego advance base and aviation reservation. Secretary Daniels's proposal for the establishment of an experimental laboratory is taken care of by the sub-committee by the appropriation of \$1,000,000. This project is endorsed by the Naval Consulting Board.

NEW ARMY BILL PASSED

THE Army Reorganization Bill has passed the Senate and the House, and will doubtless be signed by the President. Under this the Aviation Section of the Signal Corps shall consist of 1 colonel, 1 lieutenant-colonel, 8

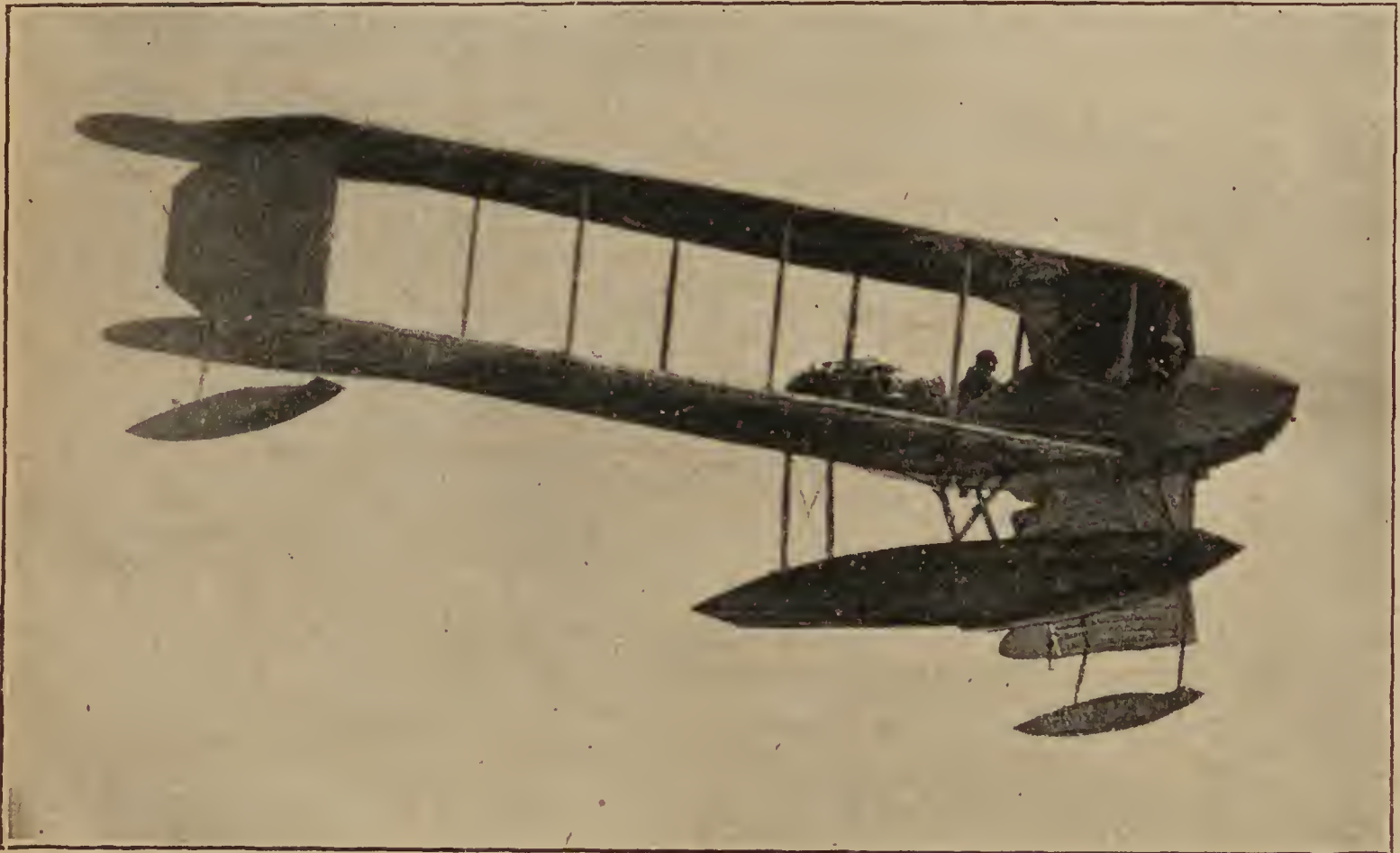
majors, 24 captains, and 114 first lieutenants, selected from officers of Army at large of corresponding grades or of grade below, exclusive of those detailed in staff corps or departments, who are qualified as military aviators, shall be detailed as aviation officers for four years unless sooner relieved. Aviation officers may, when qualified, be rated as junior military aviators or as military aviators, if they hold a certificate as qualified for the rating, issued by a board of three officers of experience in aviation service and two medical officers, under general regulations to be prescribed by the Secretary of War; none shall receive rating of military aviator until he shall have served creditably for three years as junior military aviator. Each aviation officer shall, while on duty that requires him to participate regularly and frequently in aerial flights, receive an increase of 25 per cent. in pay of his grade and length of service; junior military aviators, while so serving, to have rank, pay, and allowances of one grade higher; if their commission is not higher than captain, and while on duty requiring regular and frequent aerial flights, shall receive addition of 50 per cent. in pay

aviator, Signal Corps, shall be \$150 per month; he shall have allowances of a master signal electrician and same percentage of increase for length of service.

It is expected the removal of the age limit and the item of single blessedness will make available a greatly increased number of officers for aviation duty.

THE NEW BURGESS-DUNNE

EXTENSIVE trials were made on Saturday, May 20, of the new Burgess-Dunne seaplane, built for the Second Battalion of the New York Naval Militia. Mr. Vincent Astor, as has already been stated in these columns, was instrumental in securing this machine from the Burgess Co. at Marblehead, following his success with the seaplane constructed for himself last summer. Mr. Astor came to Marblehead on his yacht, the *Noma*, accompanied by four other members of the Second Battalion, of which he himself is an officer. Accompanying him were Lieutenant S. S. Pierce, Ensigns Blackburn and Poor, and Petty Officer Johnson. Flights in the new machine were made on Satur-



MR. VINCENT ASTOR'S BURGESS-DUNNE SEAPLANE

of grade and length of service under commission; military aviators, while so serving, to have the rank, pay, and allowances of one grade higher if commission is not higher than of captain, and while on duty requiring regular and frequent aerial flights shall receive addition of 75 per cent. of pay of grade and length of service under commission. Hereafter married officers of the line shall be eligible equally with unmarried officers, and subject to same conditions, for detail to aviation duty; Secretary of War shall have authority to cause as many enlisted men of aviation section to be instructed in flying as he may deem necessary; hereafter age of officers shall not be a bar to their first detail in the aviation sections, and neither age nor rank to subsequent detail. When it shall be impracticable to obtain from the Army officers suitable for the aviation section in the number allowed the difference may be made up by appointments in grade of aviator, Signal Corps, and that grade is hereby created; to be obtained from especially qualified civilians who shall be appointed and commissioned in said grade; whenever any aviator shall have become unsatisfactory he shall be discharged from the Army as such aviator; base pay of

day, Sunday, and Monday, under the observation of the New York officers, who expressed themselves as well pleased with the performances of the machine. On Monday the New York party returned, having accepted the seaplane, which was put through further trials by Clifford L. Webster, of the Burgess Co., and the machine was then shipped to New York on Mr. Astor's yacht on Saturday, May 27, in order to expedite the delivery and consequently facilitate the work of training the New York militia officers. The machine is regarded as one of the finest of the Dunne type ever turned out by the company. It is stream-lined throughout, and a new feature which has been introduced greatly cuts down the head resistance. This consists in mounting the radiator in the rear-end of the fuselage behind the motor, making it absolutely negligible so far as forward resistance through the air is concerned. In this position, which follows a recent practice of the Curtiss Aeroplane and Motor Co., the cooling of the motor appears to be perfect, and a problem which has long puzzled aeroplane constructors with regard to the pusher type of machine has been solved.

Meanwhile, work is rapidly progressing on the second

machine under construction by the Burgess Co. for the same militia organisation, and early in the summer the New York Militia will be far ahead of that of any other State in aviation development.

Meanwhile, tests have been continued with the Navy seaplane under the direction of Lieutenant George Murray, U.S. Navy, and have proved very satisfactory. With full load exceeding 700 lb., the machine showed a speed of 77.75 miles an hour and maintained a rate of climb of 278 ft. a minute for nine minutes.

NEW CROSS-COUNTRY RECORD

New York, May 20—Victor Carlstrom, in a 200 h.p. twin-motored "J. N." Curtiss biplane, flew from Newport News, Va., to the Sheepshead Bay Speedway, in New York, to-day, a distance of 343 miles, in four hours and one minute. This breaks the American cross-country non-stop distance record.

Stephenson MacGordon, who started at the same time in a model "R." Curtiss 160 h.p., arrived thirty-five minutes after Carlstrom's arrival.

The best previous American cross-country flight was 332 miles in four hours and forty-four minutes, made in 1914 between Des Moines, Ia., and Kentland, Ind., by the late W. C. Robinson, of the Grinnell Aeroplane Co.

Carlstrom carried as a passenger Captain Ralph L. Taylor, of the Connecticut National Guard.

The air line distance from Newport News to New York is 343 miles, according to mileage charts of an authoritative atlas.

Several aviators made flights to the Speedway from near by points on Long Island.

The flights were held in connection with a military, naval, and aviation tournament which began to-day at the Sheepshead Bay Speedway, and will be continued through next week in the interests of preparedness.

NEW YORK-WASHINGTON NON-STOP

MAY 25—Victor Carlstrom, Curtiss instructor, with a passenger, flew from the Sheepshead Bay autodrome in one of the newest 200 h.p. "J-N" twin-tractor Curtisses, non-stop to Washington, D.C., a distance of 237 miles, in 3 hours 4 minutes, an average of 79 miles an hour, where a message and a bundle of New York *Worlds* were delivered to the President. This machine is on exhibition in Washington, and will later be sent to the New Mexico Militia, to which it has been presented by a syndicate of New Mexicans.

The week of military and aviation features at the Sheepshead Bay track closed with a parachute drop from a Leo Stevens's hydrogen balloon by Radman Law, after the balloon had been exploded in mid-air by a fuse and a stick of dynamite.

Miss Stinson and Dario Resta, the famous Renault auto driver, have gone on an exhibition tour, under the management of Wm. H. Wellman and "Bill" Pickens.

The twin "J-N," on May 24, at the Sheepshead Bay Speedway, New York, piloted by Victor Carlstrom, established a speed record for that circular two-mile track which is considered excellent, especially in view of the fact that there was a strong side wind at the time. Circling the track ten times, totalling twenty miles, the elapsed time was 14 minutes 21 seconds. The necessity for almost continual banking for the turns makes this record liable to stand for some time.

The "R-2," driven by Steve MacGordon on the same track, made the circuit for twenty miles in 15 minutes 31 seconds.

The twin "J-N" also set a new altitude record for the Speedway, climbing with a passenger 14,500 ft.

The Curtiss "Speed Scout" made better speed than the above, but the record was not officially timed. Several laps were flown by this machine at a speed of 92 miles per hour.

THE SLOANE COMPANY

JOHN E. SLOANE, constructor of the Sloane military aeroplane, has disposed of his interest in the Sloane Manufacturing Co., and has retired as its president. Mr.

Sloane has a wide experience in aeronautics, and has taken an important part in perfecting the modern aeroplane as it exists to-day. After Mr. Sloane graduated from Columbia, he established a laboratory for research work in aeronautics. Here he built several experimental machines and conducted flights at Mineola.

He later purchased several French machines of the type which has shown the finest results over the trenches, and his later machines reflect the European ideas.

To the Sloane organisation came the honour of creating three American altitude records, including the record of 13,900 ft. made recently, the record flight from Los Angeles to San Diego with a passenger, etc.

Associated with Mr. Sloane in later work have been two capable engineers, Mr. Paul Daniel, formerly of the Engineering Corps of the French Army, and Mr. Charles H. Day, an American aeroplane builder. Mr. Sloane's new connection has not been announced as yet.

STURTEVANT NEWS

RECENT tests conducted on the B. F. Sturtevant Co.'s improved Model 5, 140 h.p. aeronautical motor, indicate that this engine is one of the most efficient, reliable, and highly developed aeronautical motors of its type produced at the present time.

The large amount of experience and data that has been accumulated during the past five years or more that the B. F. Sturtevant Co. have been manufacturing high-speed engines, both aeronautical and marine, has been carefully segregated and crystallised into certain definite features that have been incorporated in the improved 140 h.p. motor.

The high-grade alloy steels used in the construction of these motors are subjected to special heat treatments that have been accurately determined as a result of exhaustive experiments. These heat treatments have made possible a great increase in the tensile strength of the various steels employed; as well as reducing the weight of the various parts, although in no case has the necessary weight been sacrificed for this purpose.

All of the castings used on the motors are produced in the B. F. Sturtevant Co.'s own foundry. Incidentally, the Sturtevant Co. are recognised experts in aluminium foundry work.

A ten-hour continuous run was recently conducted on one of the U.S. Navy motors at Hyde Park. The average h.p. developed during the test at 2,000 r.p.m. was 141. On the following day a brake horse-power test was run off on the same motor, the latter developing 145 h.p. at 2,025 r.p.m. Upon completion of the test, the engine was completely disassembled for inspection. With the exception of two exhaust valves, which showed a slight indication of leakage, thus accounting for the somewhat lower horse-power developed, the various parts revealed no excessive wear.

The above tests were witnessed by Mr. F. B. Conway, the U.S. Navy Inspector of Aeronautical Material.

THE THOMAS AEROPLANE CORPORATION

The following are extracts from an announcement relating to the formation of the Thomas Aeroplane Corporation which has been issued. The advertisement in question concerns an issue of \$300,000 (£60,000) 7 per cent. cumulative participating preferred stock, preferred both as to assets and dividends:—

Business—The Thomas Aeroplane Corporation is to be formed to take over (either directly or by ownership of all the issued and outstanding capital stock) the entire business and property of the Thomas Bros. Aeroplane Co., Inc., and the Thomas Aeromotor Co., Inc.

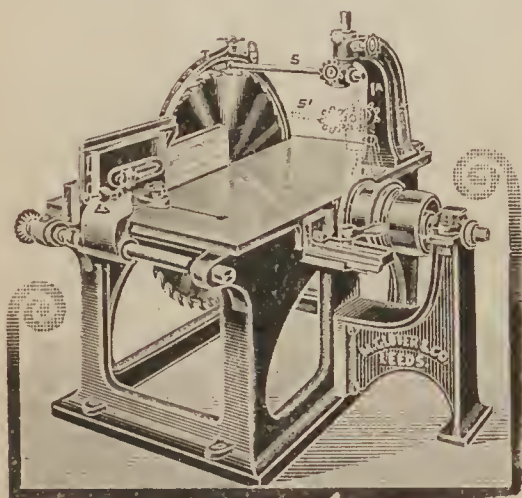
Capitalisation—The capitalisation of the company is to be: Authorised, \$1,000,000 7 per cent. cumulative participating preferred stock, par value \$100, issued \$500,000; authorised, 30,000 shares common stock, without par value, issued 30,000 shares. No bonds, notes or other indebtedness.

We summarise from a letter by William T. Thomas, President of the Thomas Companies: "Preferred stock is to participate share for share with the common stock in any dividends paid in any one year after \$10 per share shall have been paid upon the common stock in such year. 20 per cent. of net earnings after payment of preferred dividends will be set aside annually as a sinking fund to retire the preferred stock at \$110 a share."

SAFEGUARDING MACHINERY

It is now fairly well known that the obligation to guard dangerous machinery is statutory, and, although we are still disinclined to allow that in many instances accidents more or less serious in nature are not the direct outcome of carelessness or incompetence or both, the one fact is patent that every effort should be made to render machinery as safe as it is possible to make it, without disturbing the workman or detracting from the normal output of the machine or tool entrusted to him to manipulate.

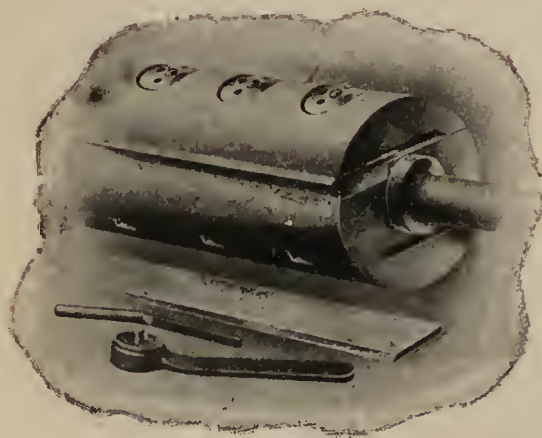
In the wood-working section of works for the construction of aircraft a couple of very dangerous tools come to our mind, in connection with which it is necessary that the most efficient forms of protection be employed. We refer to the circular saw and the planing machine. In this connection we are reminded of a type of saw-guard familiarly known as the "Ideal," which we understand has been largely



PATENT IDEAL SAW GUARD SHOWN FITTED TO BENCH

adopted by thousands of high-class firms at home and abroad. It is neatly designed, specially made of brass and steel, and beautifully finished. The essential parts consist of a supporting bracket (which may be arranged in accordance with the requirements of the bench), a sliding front hood, central rocking piece, and a hinged riving or back knife, which is firmly fixed linable with the saw, the whole being adjustable for various smaller diameters of saws. We illustrate this appliance fitted to one of the high-class saw benches, for manufacturing which the patentees of the patent "Ideal" saw-guard are also well known.

Illustration No. 2 shows an effective appliance for reducing what is otherwise a most dangerous to a comparatively



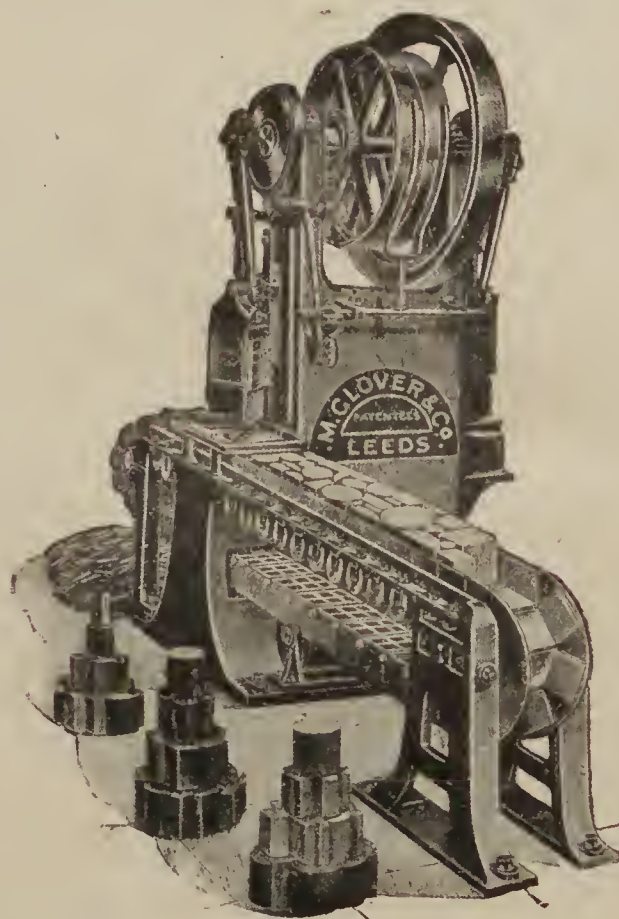
SAFETY CIRCULAR CUTTER BLOCK

harmless and useful tool—we refer to the safety circular cutter block, which, in addition to being specified in new machines, can also be fitted to existing wood-planing

machines. Besides the particular advantage of a finger saver, this safety block is of great necessity to woodworkers, as, owing to its peculiar construction with an adjustable riving knife, better finish may be obtained when working hard wood than with the old style square block, less power is necessary to drive it, there is also practically no balancing when fitting, and the cutters only cost about a quarter of the price of the old style.

The same firm, Messrs. M. Glover and Co., sawmill engineers, were also pioneers in the manufacture of the patent emery wheel saw sharpening and gulleting machines, now so extensively employed by users of saws.

We might also here draw attention to other specialities of this firm—namely, their patent firewood and firelighter machinery, which we understand has been adopted by very important firms, railway companies, for utilising waste wood, sawdust, etc., which otherwise had been allowed to show no return. Messrs. Glover and Co.'s patents have



PATENT LABOUR-SAVING WASTE-WOOD CHOPPER

developed these machines to such an extent that it has been well remarked of their machinery that it seems to be instinct with life and reason, and to be endowed with capabilities previously considered to be possessed only by the human mind; and the aspect that we would bring before our readers is that it is well worthy the attention of those who may be or are able to obtain waste wood sawdust or other workshop waste, for an important accessory or even separate industry can readily be established yielding remarkable results. Illustration No. 3 shows one of Messrs. Glover's firewood chopping machines, an adaptation of which has been supplied for breaking up waste for burning in gas suction plants, and also for reducing wood for the manufacture of specially designed loco firelighters.

In these days of daily exhortations to rigid economy one cannot help thinking that in numerous of our large works there must be an enormous amount of waste wood, etc., which might be profitably utilised by such machinery. Messrs. Glover and Co., patentees, Leeds, would be glad to answer any inquiries about their special machines.

MODEL AEROPLANES—XXXV

By F. J. CAMM

IN Chapter XXVII. I stated that no English model-aero-plane firm was manufacturing a compressed air plant. Perhaps it is necessary to qualify this remark by stating that a plant is obtainable from Gamages, of High Holborn, and this brief allusion to it has been prompted by the fact that, while many readers are capable of constructing the model I have illustrated in the last five contributions, many are unable to construct the plant; and, as indications are not lacking that power-driven models will become as popular as rubber-driven ones, it is well that those unable—probably through lack of facilities—to undertake the construction of a plant should be catered for by our model-aero firms.

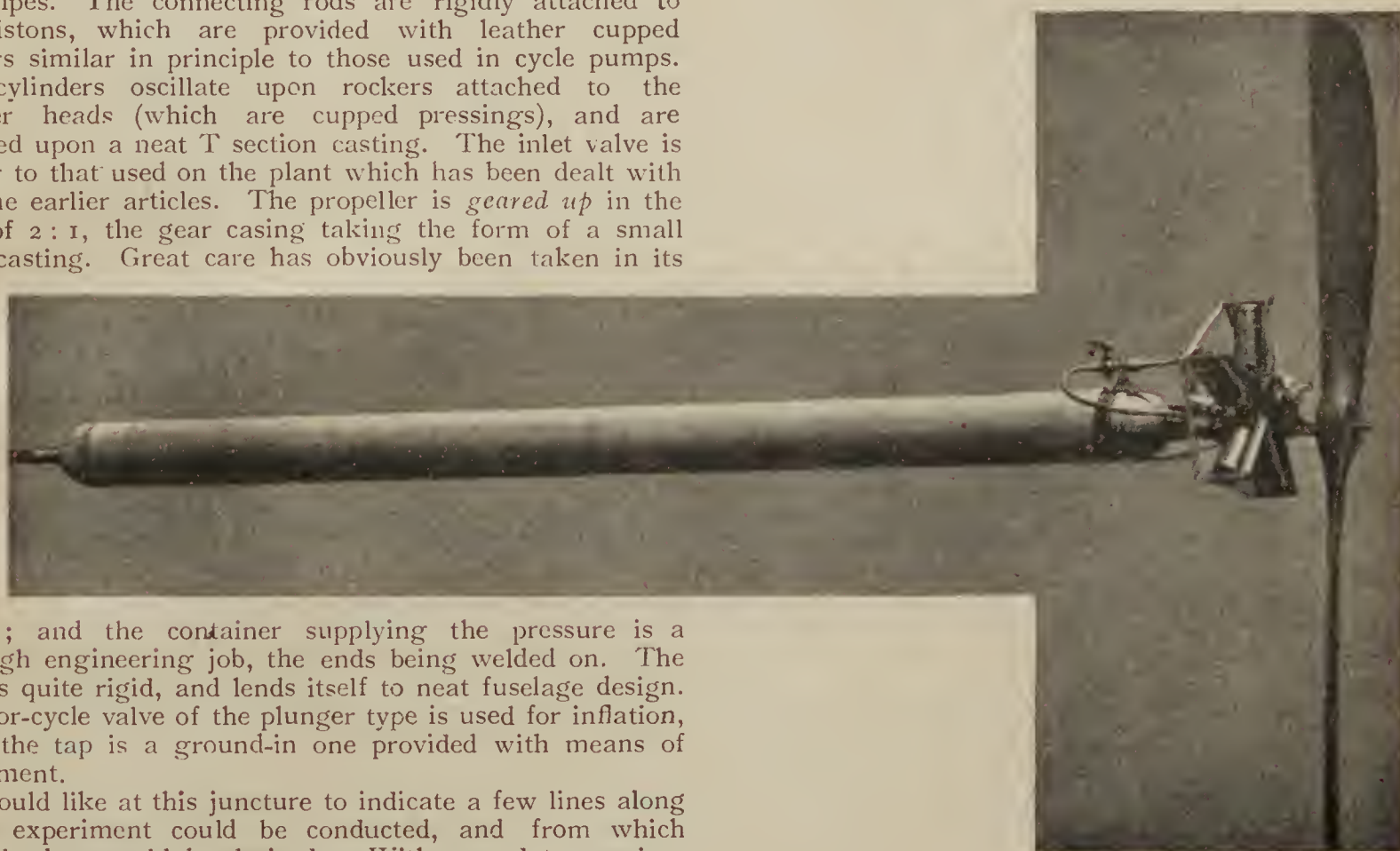
I have been afforded an opportunity of inspecting one of these plants, a photograph of which appears on this page. It is extremely ingenious, of clean design, and would fly a machine weighing 30 oz. or so. Particularly neat is the inlet and exhaust arrangement, which takes place through hollow connecting rods, and thus eliminates the use of inlet pipes. The connecting rods are rigidly attached to the pistons, which are provided with leather cupped washers similar in principle to those used in cycle pumps. The cylinders oscillate upon rockers attached to the cylinder heads (which are cupped pressings), and are mounted upon a neat T section casting. The inlet valve is similar to that used on the plant which has been dealt with in some earlier articles. The propeller is *geared up* in the ratio of 2:1, the gear casing taking the form of a small brass casting. Great care has obviously been taken in its

at its most efficient speed, and some data on the point would be valuable. I hope to be able to make some experiments concerning the comparative efficiency of equal gearing, gearing up, and gearing down of c.a. motors.

It has been advanced against the compressed air engine that the r.p.m. not being constant places it on the same level as the rubber motor. It is possible, in the writer's opinion, to so regulate the pressure that it is supplied to the engine at a constant velocity. Two possible ways readily occur. One is to use a valve (from which the feed pipe to the engine grows) that opens as the pressure grows less, and closes when the pressure is high. Such a valve would obviously be automatic in action, and would only require careful initial adjustment.

The second method would be to use a mechanically operated valve, actuated by a worm gear driven either off the propeller shaft or from the engine. *There* is a second line of experiment from which much could be learned.

Another interesting test would be to ascertain the com-



design; and the container supplying the pressure is a thorough engineering job, the ends being welded on. The body is quite rigid, and lends itself to neat fuselage design. A motor-cycle valve of the plunger type is used for inflation, while the tap is a ground-in one provided with means of adjustment.

I should like at this juncture to indicate a few lines along which experiment could be conducted, and from which valuable data could be derived. With regard to gearing. On the plant shown in the photograph *gearing-up* is employed. My own experience seems to indicate that equal gearing or even gearing-down would give better results. I once built and flew a large weight-lifting monoplane, some twenty ounces in weight, which took exactly *twenty-four strands* of rubber to fly. Equal gearing was employed, twelve strands to each gear. With approximately 400 turns thirty seconds' duration was obtained. It would appear that this is a fairly good result for so heavy a model, but judged upon a basis of $\frac{\text{weight of model}}{\text{weight of rubber}}$ (which incidentally is a sound test of efficiency) a very low ratio indeed is obtained.

Now, a friend of the writer's built a similar model, the only difference being that the propeller was geared down in the ratio of 2:1. Under test, with the identical propeller used on the writer's motor, exactly the same results were obtained with *eight strands less* rubber—that is to say, thirty seconds for nearly four hundred turns. That is one possible field for experiment—gearing. Owing to the very high initial speed of compressed air engines, gearing sometimes becomes essential in order that the propeller may revolve

parative efficiency of two engines similar in principle, bore, stroke, etc., differing only with regard to the number of cylinders, one being, say, a three-cylinder and the other a five. It would also be interesting to compare the differences in duration (as well as thrust), and to elicit what diameter of propeller each was capable of driving.

One could cite many ways in which experiment could be undertaken. The most efficient valve is an interesting subject, and provides ample room for ingenuity. The double-acting type of engine, which undoubtedly possesses a good thrust to weight ratio, the merits of the carbon dioxide engine (CO_2), and the possibilities of the compressed air driven model hydroplane, with the floats forming the container, are all points worthy of the closest attention and investigation, some of which I shall deal with hereafter.

(To be continued)

NOTE.—We are pleased at all times to reply to queries relating to models and kindred matters. To ensure a reply in the subsequent week's issue queries should reach this office by first post Monday morning.

AIRCRAFT IN ACTION

OFFICIAL INFORMATION

ENGLAND

June 18—Eight Enemy Machines Engaged—In better weather conditions yesterday (June 17), a great deal of flying was done, and there was a marked increase in the activity of hostile aircraft. One of our machines attempted to intercept a hostile reconnaissance consisting of eight machines, driving one down close behind the German trenches. Our machine, trying to cut off the remainder, engaged the rear machine and drove it down a few miles behind the enemy's lines. In all, there were thirty combats in the air, but no other decisive results. Except for this aerial activity, the last twenty-four hours have been quiet.

FRANCE

June 17—Bombardment of Dunkirk and Bar-le-Duc—On the night of the 16th three enemy aeroplanes bombarded the region of Dunkirk. Nobody was injured and little damage was done. At eight o'clock in the evening Bar-le-Duc was bombarded by enemy machines. There were four killed and some fifteen wounded among the civilian population. Late in the evening a number of bombs were dropped upon Pont-à-Mousson by German aeroplanes without any result. On the night of the 16th one of our bombarding squadrons dropped twenty-nine shells of 120 millimetres and four of 155 millimetres on the railway stations of Longuyon, Montmédy, and Audin le Ronan.

(See German Official)

June 17—Bombs on Bar-le-Duc—Bar-le-Duc was again bombarded in the course of the afternoon (June 17). The bombs dropped caused slight material damage and some persons were wounded.

June 18—Bombardment of Bar-le-Duc—On the Verdun front our aviators fought a number of engagements with German machines sent to bombard Bar-le-Duc. In the course of these encounters two enemy aeroplanes were brought down, one near Malancourt (west of the Meuse), the other near Samogneux (east of the Meuse). Three other German machines caught by machine-gun fire at close quarters were compelled to come down vertically—the first at Fresnes (south-east of Verdun), the second at Septsarges (north of Malancourt), the third in the outskirts of Béthincourt (east of Malancourt). In Lorraine four of our machines gave battle to four Fokkers above the enemy lines. Two of the latter were brought down to the east of Bezanges (north-east of Nancy), one of them falling in flames. One of our machines was compelled to alight. Our bombarding squadrons have also shown great activity. Twenty-four shells were dropped on enemy depots near the Semide railway station (Vouziers district), twenty big calibre shells on factories at Thionville (north of Metz), where two explosions were noted, and a score of projectiles on the aviation establishments at Etain (north-east of Verdun) and Tergnier (north of Chauny). In the course of the night enemy machines dropped bombs on Pont-à-Mousson, Nancy, and Baccarat. The material damage was insignificant. One person was wounded at Baccarat.

(See German Official)

RUSSIA

June 16—Bombs on Tarnopol—A hostile aeroplane has dropped bombs on Tarnopol.

EGYPT

June 12—Turkish Aeroplane Attack—War Office announcement. The General Officer Commanding-in-Chief in Egypt reports that hostile aeroplanes attacked Kantara with bombs and Romani with machine-gun fire on June 11, but were driven off by our aircraft. A few minor casualties were caused at Kantara, but none at Romani. Kantara is a post on the eastern side of the Suez Canal between Port Said and Ismailia.

June 14—Air Raid on Suez Canal—War Office announcement. The General Officer Commanding-in-Chief in Egypt reports that a successful air attack was carried out by us on June 13 against the enemy camps and aerodrome at El Arish and an enemy camp at Bir Mazar, all of which were effectively bombed. A Fokker which attacked our machines was engaged and driven down. On the same day a hostile aeroplane attacked Serapeum, but did no damage, and caused only three minor casualties. After this attack the machine attempted to drop bombs on ships in the Suez Canal, but without result, and was eventually driven off by our gunfire.

(See Turkish Official)

ITALY

June 12—Venice Again Bombed—Enemy aviators threw bombs on Vicenza, hitting the military hospital, and also on Thiene (north of Vicenza), Venice, and Mestre (near Venice), doing some slight damage.

(See Austrian Official)

June 13—Sea Raids in the Adriatic—During the night of the 11th inst. some enemy seaplanes dropped bombs on Venice, causing very slight damage. One woman was killed and four other civilians injured. At dawn on the same day our torpedo-boats approached a place on the Istrian Peninsula, and after carrying out a reconnaissance bombarded an important point near Parenò. Our torpedo-boats were persistently but vainly attacked on their return journey by five enemy seaplanes. On the morning of the 12th inst., in the Upper Adriatic, one of our seaplanes, after repulsing an attack by an enemy machine, dropped

bombs on the military establishments near Trieste, in spite of the lively fire of the Austrian anti-aircraft batteries.

(See Austrian Official)

June 15—Bombs on Railway Station—Squadrons of Caproni aeroplanes bombarded with excellent results the railway station of Mattarello (Lagarina Valley) and encampments at the junction of the Nos and Campoinulo Valleys (on the Asiago Plateau). Enemy aeroplanes dropped bombs on Padua, S. Giorgio di Nogaro, and Porto Rosega. Two persons were wounded, and the damage was very slight.

(See Austrian Official)

June 17—Bombs on Enemy Encampments—Hostile aircraft dropped bombs on various points of the Venetian plain and on the town of Padua, killing three persons and wounding eight. On the 15th six of our Caproni aeroplanes bombarded the railway station of Mattarello, in the Adige valley. Yesterday (June 16) a squadron of 37 Capronis and Farmans dropped 160 bombs and 60,000 arrows on enemy encampments north of Asiago and in Nos Valley. The whole squadron returned safely. Two hostile machines were brought down.

BALKANS

June 14—Enemy Aircraft Driven Off—Bulgarian official. In the afternoon (June 10) four of our aeroplanes attacked the ships with bombs and forced them to retire at full speed in the direction of Thasos. Our aeroplanes, although vigorously fired at, returned safely.

TURKEY

June 13—Raid on Smyrna—Yesterday morning (June 12) five hostile aeroplanes dropped about 50 bombs on Smyrna, killing some men, women and children, and destroying some houses.

June 15—Raid on Suez Canal—On Sunday last (June 11) our aeroplanes attacked with bombs and machine-guns an English camp on the Suez Canal near Reman and Kantara and caused great disorder. They also attacked a British seaplane and forced it to return to the mother ship.

(See English Official)

June 16—Bombardment of Smyrna—In Smyrna waters an enemy monitor, assisted by two aviators, fired, without result, some twenty shells against Beah, south of Fotcha (Phokia), and then withdrew.

June 17—Enemy Aircraft Driven Off—Two aeroplanes and two torpedo boats which endeavoured to approach Seddul Bahr were driven off by our fire. On June 13 two aviators dropped bombs on El Arish, but were driven off by Turkish aeroplanes after an air fight. Subsequently other Turkish aeroplanes dropped bombs and fired with machine-guns on the enemy aerodrome. It is reported from Smyrna that as the result of the aerial bombardment on June 11 three women (two Armenian and one Greek) were killed and twenty-four persons, two of whom have since died, severely wounded. One large building and twelve smaller houses were destroyed and several others severely damaged.

AUSTRIA

June 12—Bombs on Venice—A squadron of naval aeroplanes last night (June 11) bombarded the railway between San Dona and Mestre and the railway works at Mestre with good results. An engine-shed was hit several times. Some bombs were also dropped on the arsenal of Venice. In spite of a heavy anti-aircraft fire all our aeroplanes returned.

(See Italian Official)

June 13—Italian Naval Raid—In the morning of June 12 three enemy torpedo units penetrated into the harbour of Parenzo, Istria. They were driven off by the defensive batteries and by aeroplanes. Their artillery fire remained without result. Only a wall and a roof were slightly damaged. Nobody was wounded, whilst the batteries and the aeroplanes succeeded in scoring hits.

(See Italian Official)

June 14—Bombs on Military Buildings—Our seaplanes again attacked the railway and the military buildings at San Giorgio di Nogara (north of Grado), and the inner harbour at Grado (at the western end of the Gulf of Trieste).

June 15—Bombs on Verona and Padua—Our aviators dropped bombs on the railway station at Verona and Padua.

(See Italian Official)

June 16—Successful Raids on Railways—A squadron of seaplanes successfully bombarded, on the night of June 15, the railway station and the precincts of Porto Gruaro and Latisana, the railway line between Porto Gruaro and Latisana, while a second squadron attacked the railway station and military works at Motta di Livenza, and a third squadron the enemy positions near Monfalcone and other places. Several effective hits were observed in the railway stations and military positions and fires were seen to break out. Despite a heavy bombardment all the aircraft returned safely.

GERMANY

June 13—Russian Aeroplane Brought Down—Near Podhaice (west of the Galician battle-front) a Russian aeroplane was brought down by a German aviator in an air fight, the pilot and the observer, a French officer, being captured. The aeroplane is in our hands.

June 14—Russian Railway Buildings Destroyed—German aviators in the past few days have undertaken far-reaching enterprises against railways behind the Russian front. Several troop trains were stopped and railway buildings were destroyed.

June 17—Bombardment of Military Stations—The aerial activity on both sides was considerable. Our air squadrons abundantly pelted with bombs objects of military importance at Bergues—French Flanders—Bar-le-Duc, and in the regions of Dombasle, Einville Lunéville, and Blainville.

(See French Official)

June 18—Renewed Attack on Bar-le-Duc—The air attack on military works at Bar-le-Duc was repeated. A French biplane was brought down and destroyed by our anti-aircraft guns west of Lassigny (west of Noyon). In the district of Bezanges-le-Grand, south of Château Salins, Lieutenant Wintgens brought down his sixth, and Lieutenant Hohendorf his fifth, enemy aeroplane. The occupants of one machine were killed. On Friday evening (June 16) the burning *débris* of a French biplane, which had been defeated in an air fight, was observed north-east of the Hesse Wood (west of Verdun).

FROM OTHER SOURCES

ENGLAND

June 15—Submarine's Fight with Seaplane—The journal *Politiken*, of Copenhagen, states that a furious fight took place this afternoon between a British submarine and a German seaplane outside Ystad, off the coast of Scania. The seaplane endeavoured to drop several bombs on the submarine, which, however, was not hit. The submarine fired at the seaplane, which disappeared in a damaged condition.

EAST AFRICA

June 12—Camp Bombarded—The correspondent with General Smuts states: "The camp at Mkalamo, on the northern railway in German East Africa, shows signs of severe bombing by aeroplanes."

June 14—Bombs on German Gunboat—From Belgian official source. On Lake Tanganyika Flight-Lieutenants Behaeghe and Collignon, on a hydroplane, flew over the German port of Kigoma, the terminus of the Ujiji-Dar es Salaam line. On Saturday (June 10) they dropped bombs on the German gunboat Graf von Golze. Two bombs struck the ship, causing serious damage.

FRANCE

June 16—Nungesser's Exploits—Nungesser, the French aviator, recently brought down his seventh German aeroplane. Two days later he attacked a German captive balloon, which fell to earth in flames. This is the second captive balloon he has brought down, and he has taken part in 55 aerial bombardments.

June 17—Bombs on French Town—A German aeroplane dropped two bombs this morning (June 17) at Nogent-sur-Seine. Two houses were slightly damaged, but nobody was hurt.

June 17—Boelke Shot Down—The *Matin* states that Flight-Captain Boelke, who enjoyed with Flight-Lieutenant Immelmann the distinction of being Germany's champion aviator, has been brought down by the French Flight-Adjutant Roger Ribiere on the Verdun front. Flight-Captain Boelke first won international fame at the beginning of this year, when it was claimed for him that he had brought down his seventh machine. During May, Boelke is said to have brought the number of his victims up to sixteen, and was then promoted to a captaincy. Flight-Adjutant Ribiere, the successful French aviator, is the son of M. Ribiere, of the French Senate, and has already distinguished himself by several daring exploits during recent operations.

[The identity of the pilot has not been confirmed—Ed.]

HONOURS FOR THE R.F.C.

The *London Gazette* of June 6 notified that the Field-Marshal Commanding-in-Chief, Home Forces, has recommended to the Army Council the names of the undermentioned officers for distinguished service in connection with the defence of London against hostile air raids:

Major F. V. Holt, D.S.O., Oxfordshire and Buckinghamshire Light Infantry and Royal Flying Corps.

Major T. C. R. Higgins, The King's Own (Royal Lancaster Regiment) and Royal Flying Corps.

Second Lieut. A. de B. Brandon, Royal Flying Corps (Special Reserve).

Second Lieut. C. A. Ridley, Royal Fusiliers and Royal Flying Corps.

These officers have shown great bravery and readiness to take risks of all sorts, going up and landing at night in all weathers, more often than not under most dangerous conditions. Second Lieut. Brandon is the first pilot to succeed in dropping bombs on a Zeppelin at night.

MENTIONED IN DESPATCHES

The following members of the Air Services were mentioned in General Sir Douglas Haig's despatch, dated April 30:—

Trenchard, Brevet Col. (temporary Major-Gen.) H. M., C.B., D.S.O., A.D.C., Royal Scottish Fusiliers.

ROYAL NAVAL AIR SERVICE

Bell, Flight Sub-Lieut. S.; Campbell, Flight Lieut. W. H. E.; Burne, No. F.4595 Petty Officer W. E.; Hart, No. F.2689 Leading Mech. C. W.

ROYAL FLYING CORPS

Brooke-Popham, Major (temp. Brig.-Gen.) H. R. M., D.S.O., Oxfordshire and Buckinghamshire Light Infantry; Salmond, Major (temp. Brig.-Gen.) J. M., D.S.O., Royal Lancashire Regt.; Donaldson-Hudson, Major R. C. (T.F. Reserve); Hynes, Capt. (temp. Major) G. B., R.A.; Newall, Major (temp. Lieut.-Col.) C. L. N., 2nd Gurkha Rifles; Bourke, Capt. (temp. Major) U. J. D., Oxfordshire and Buckinghamshire Light Infantry; Harvey-Kelly, Capt. (temp. Major) H. D., D.S.O., Royal Irish Regt.; MacNeece, Capt. (temp. Major) W. F., Royal West Kent Regt.; Bell-Irving, Capt. M. McB., D.S.O., S.R.; Bettington, Capt. A. V., S.R.; Cooper, Lieut. (temp. Capt. in Army) H. L., S.R.; Erskine, Temp. Lieut. R., Royal Scottish Fusiliers (Service Bn.); Grubb, Capt. R. R. de C., 3rd Highlanders; Lewis, Capt. R. E., West India Regt.; Morison, Lieut. (temp. Capt.) A. M., S.R.; Morton, Lieut. (temp. Capt.) A. H., R.F.A.; Tennant, Capt. J. E., Scots Guards; Wynne-Eyton, Temp. Capt. C. S. (Special List); Cunningham, Lieut. (temp. Capt.) J. A., R.F.A.; Oxenham, Lieut. (temp. Capt.) H. A., S.R.; Adams, Lieut. A. B., S.R.; Child, Second Lieut. (temp. Lieut.) A. J., London Regt., T.F.; De Courcy, Lieut. J. A. G., R.G.A.; Milne, Temp. Lieut. J. T., Oxfordshire and Buckinghamshire Light Infantry; Murray, Lieut. (temp. Capt.) K. D. P., S.R.; Norman, Temp. Lieut. G. H., S.R.; Russell, Lieut. H. B., R.F.A.; Allcock, Second Lieut. (temp. Capt.) W. T. L., S.R.; Babington, Second Lieut. (temp. Capt.) P., Hampshire Regt.; Goldsmith, Second Lieut. (temp. Capt.) N., R.A.; Henderson, Second Lieut. (temp. Lieut.) M., D.S.O., Seaforth Highlanders; Boyton, Temp. Second Lieut. G. G., Special List; Faber, Second Lieut. C., S.R.; Hallam, Temp. Second Lieut. W. A. W., A.S.C.; Hughes, Temp. Second Lieut. T. McK., King's Royal Rifle Corps; Mackay, Second Lieut. H. A. D., Hampshire Regt.; Medhurst, Second Lieut. C. E. H., Royal Inniskilling Fusiliers; Morris, Temp. Second Lieut. J., Special List; Plenty, Lieut. E. P., Manchester Regt.; Solomon, Temp. Second Lieut. J. B., Oxfordshire and Buckinghamshire Light Infantry; Thayre, Second Lieut. F. J. H., S.R.; Vagg, Second Lieut. H. R., Somersetshire Light Infantry; Mead, Qmr. and Hon. Lieut. J.; Starling, Qmr. and Hon. Lieut. (temp. Capt. in Army) J.

McCrae, 174 Serg.-Maj. J.; Robbins, 263 Serg.-Maj. H. V.; Fulton, 1112 Acting Serg.-Maj. J. (Flight Serg.); Hayward, 255 Acting Serg.-Maj. W. C. (Flight Serg.); Fitzgerald, 1705 Flight Serg. M. B.; Foster, 2292 Serg. R. G.; Greenup, 2443 Serg. B. G.; Hunt, 2057 Serg. H. E.; Mantell, 3599 Serg. W. G.; Newton, 217 Flight Serg. D. H.; Northcote, 7146 Serg. R. S.; Rapley, 1027 Serg. C.; Storey, 184 Flight Serg. J.; Hepple, 780 Corp. G. W.; Isles, 1961 Corp. A.; Bell, 4310 First Class Air Mech. G. D.; Green, 1711 First Class Air Mech. G.; Lathean, 681 First Class Air Mech. J. A.; McSwiney, 3799 First Class Air Mech. T. L.; Shearing, 5853 Corp. S.

CASUALTIES

ROYAL NAVAL AIR SERVICE

DROWNED

May 21.

Viney, Flight Lieut. Taunton E., D.S.O., R.N.

ACCIDENTALLY KILLED

June 10.

Williams, Flight Sub-Lieut. George K., R.N.

ROYAL FLYING CORPS

KILLED

Stubbs, Second Lieut. R. A., Royal Munster Fusiliers, attached R.F.C.

Second Lieut. Reginald A. Stubbs, Royal Munster Fusiliers, attached Royal Flying Corps, was killed on June 8 in landing after making an early morning air patrol. When the war broke out he had completed his second year at Keble College, where he was studying for holy orders. He immediately joined the University and Public Schools Corps, and shortly after was promoted to be a corporal. Last November he joined the Royal Flying Corps, and gained his "wings" in March. He flew over to France with his squadron only ten days before he was killed.

WOUNDED

Clarke, Capt. A. C., Duke of Cornwall's Light Infantry and R.F.C.

Colman, Second Lieut. G. H., R.F.C.

Russell, Lieut. W., R.E., attached R.F.C.

Walker, Second Lieut. R. V., Connaught Rangers, attached R.F.C.

Nicholson, 23322 Second Class Air Mech. C. R., R.F.C.

White, 23400 Second Class Air Mech. S. J., R.F.C.

PRISONER OF WAR

Donald, 3022 Col. T. (Dunfermline), R.F.C.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER

Jones, 2104 Serg. E., R.F.C.

APPOINTMENTS

ROYAL NAVAL AIR SERVICE

Following Probationary Flight Sub-Lieuts. (temp.) to be Flight Sub-Lieuts. (temp.):

K. C. Buss: July 15.
 G. Preen, W. S. Wilson: July 18.
 C. J. Hallinan: August 7.
 G. G. Simpson: August 8.
 A. B. Helbert: August 24.
 G. D. Smith: September 6.
 H. J. T. Saint: September 17.
 C. D. Booker: September 18.
 A. O. Brissenden: October 3.
 C. H. B. Jenner-Parson: October 9.
 B. A. Trechmann: October 11.
 R. Davies: October 13.
 M. Lyon: October 20.
 J. C. Watson: October 29.
 S. T. Edwards, J. W. Hobbs, P. E. Beasley: October 31.
 A. G. Woodward, W. Huggan: November 6.
 L. Whitworth, J. A. Page, D. M. B. Galbraith: November 15.
 D. C. Waylen: November 22.
 H. R. Wambolt, F. C. Armstrong, M. B. Walker, C. E. Moore: December 1.
 C. J. Wyatt: December 6.
 N. R. Cook: December 7.
 J. R. S. Devlin: December 10.
 B. N. Harrop, S. V. Trapp, H. H. Arundel, M. Lewis: December 16.
 A. Durston: December 21.
 S. Burton, S. S. Benson, J. A. Yonge, P. E. Bayley: December 24.
 L. S. Breadner: December 28.
 M. Hunter: January 17.
 J. L. Gordon: January 18.
 N. Wallis: January 25.
 G. G. R. Fraser: January 31.
 D. C. Page: February 8.
 H. G. Nares: February 11.
 G. F. Browne: February 14.
 G. B. Carr: February 19.

The following have been entered as Probationary Flight Sub-Lieuts. (temp.), with seniority of June 18, and appointed to "President," for R.N.A.S.:

V. C. E. Marten-Gwilliam, E. P. Will, V. C. Holyman, E. McTurk, E. A. Bolton, E. B. Gammon, F. C. Walker, A. R. Jones, E. S. Arnold, S. F. Ingram, D. F. W. Baden-Powell, N. G. Hodson, E. Pierce, W. J. de Salis, T. R. Swinburne, J. S. May, A. S. Mather, D. I. Davies, G. H. Stephens, J. S. Wright, and E. W. Keesey.

Probationary Flight Sub-Lieut. (Temp.):

J. A. Nash, granted a temp. commission as Sub-Lieut. (R.N.V.R.), with seniority of June 14, and appointed to *President*, for R.N.A.S.
 L. G. Steel, P. H. Ingham, and M. S. Walker, all entered as Probationary Flight Sub-Lieuts., with seniority of June 18, and appointed to *President*, for R.N.A.S.
 A. A. N. Haywood, D. G. McGregor, A. C. Stevens, and G. N. Jackson, all granted temp. commissions as Sub-Lieut. (R.N.V.R.), with seniority of June 14, and appointed to *President*, for R.N.A.S.
 Temp. commissions as Lieut. and Sub-Lieut. (R.N.V.R.) respectively have been granted to S. C. H. Davis and J. M. Stuart, with seniority of June 15, and both appointed to *President*, additional, for R.N.A.S.

ROYAL FLYING CORPS

The following appointments are made:

Flight Commanders, from Flying Officers:

Capt. G. de Havilland, S.R.: April 30.
 Capt. H. Colmore, 7th Hussars: May 24.
 Capt. Lord A. R. Innes-Ker, D.S.O., Royal Horse Guards: May 25.
 Temp. Capt. C. A. Hooper, S.R., and to retain his temp. rank whilst so employed: May 31.
 Capt. G. A. Parker, Northamptonshire Regt. (Observer): June 2.

Flight Commanders, from Flying Officers, and to be temp. Cpts. whilst so employed:

Lieut. S. H. B. Harris, S.R.: June 2.
 Temp. Second Lieut. J. Callaghan, General List: June 5.

To be Temp. Capt. for Duty with R.F.C.:

H. E. A. Lindsay, late Capt., Reserve of Officers, to be Temp. Capt. for duty with R.F.C.: March 18 (substituted for notification in *Gazette* of March 28).

Flying Officers:

Lieut. B. M. Hay, Canadian Engineers; Lieut. W. P. A. Ascroft, Australian F.C.: May 16.
 Temp. Second Lieut. T. S. Green, attached North Staffordshire Regt., and to be transferred to the General List; Second Lieut. B. V. S. Smith, Royal Warwickshire Regt., and to be seconded: May 17.
 Lieut. L. T. N. Gould, R.A., from an Observer: May 19.
 Capt. M. G. B. Copeman, Leicestershire Regt., and to be

seconded; Lieut. I. M. Matheson, Seaforth Highlanders, S.R., and to be seconded; Second Lieut. W. E. Birch, South Lancashire Regt., T.F.; Second Lieut. A. R. L. Goodson, London Regt., T.F., from an Observer; Second Lieut. J. Gibson, Devonshire Regt., T.F.; Temp. Second Lieut. N. F. D. Buckridge, King's Royal Rifle Corps, and to be transferred to General List; Second Lieut. L. I. T. Hewer, S.R.; Second Lieut. A. Gordon-Bond, S.R.; Second Lieut. J. L. Morridge, S.R.; Temp. Second Lieut. L. C. Fawcner, General List; Second Lieut. W. B. Sherwood, S.R.; Second Lieut. G. R. McCubbin, S.R. Temp. Second Lieut. K. K. Turner, General List; Second Lieut. J. W. James, S.R.; Second Lieut. J. A. Brown, S.R.; Second Lieut. H. F. Fisher, S.R.; Second Lieut. the Hon. M. Greville, S.R.; Second Lieut. P. C. Garratt, S.R.: May 20.

Temp. Lieut. L. E. Whitehead, King's Royal Rifle Corps, and to be transferred to the General List; Lieut. A. W. L. Ellis, Australian F.C.; Second Lieut. E. P. Roberts, Royal Sussex Regt., and to remain seconded; Second Lieut. P. F. W. Bush, S.R.: May 21.

Second Lieut. J. E. Catherall, Royal Warwickshire Regt., from a Flying Officer (Observer); Second Lieut. D. W. S. Paterson, S.R.; Second Lieut. J. C. McMillan, Royal Scots Fusiliers, and to be seconded; Second Lieut. L. C. Angstrom, S.R.; Lieut. R. H. Marshall, Northamptonshire Regt., S.R., from a Flying Officer (Observer); Temp. Lieut. J. M. E. Shepherd, General List, from a Flying Officer (Observer); Temp. Second Lieut. G. A. Thompson, Royal Sussex Regt., and to be transferred to the General List; Second Lieut. W. W. Stainer, Royal Sussex Regt., T.F.; Second Lieut. C. R. Steele, Yorkshire Regt., and to be seconded: May 22.

Lieut. J. H. C. Minchin, Scottish Rifles, from a Flying Officer (Observer); Second Lieut. J. L. P. Armstrong, A.S.C., T.F., from an Assistant Equipment Officer; Temp. Second Lieut. K. A. Creery, General List, from a Flying Officer (Observer); Second Lieut. E. M. Smith, S.R.: May 23.

Capt. Lord A. R. Innes-Ker, D.S.O., Royal Horse Guards, and to be seconded; Second Lieut. (Temp. Lieut.) O. Stewart, Middlesex Regt., T.F.; Temp. Lieut. H. E. Fletcher, General List, from a Flying Officer (Observer); Temp. Second Lieut. S. G. Kingsley, York and Lancaster Regt., and to be transferred to the General List; Lieut. (Temp. Capt.) R. H. D. Lee, Norfolk Regt., T.F.; Lieut. R. P. Harvey, Norfolk Regt., T.F.; Second Lieut. S. E. Pither, King's Own Scottish Borderers, from a Flying Officer (Observer); Second Lieut. (on probation) R. Sherwell, Lincolnshire Regt., S.R., and to be seconded; Temp. Second Lieut. T. F. Bassett-Smith, General List; Second Lieut. G. H. E. Rippon, S.R. (since deceased); Temp. Second Lieut. A. R. Johnston, General List, from a Flying Officer (Observer); Temp. Second Lieut. J. Godlee, General List: May 24.

Lieut. G. C. O. Osborne, Canadian Motor Machine-Gun Service; Second Lieut. (on probation) G. H. Bonnell, R.A., S.R.: May 25.

Lieut. E. J. D. Routh, King's Royal Rifle Corps, S.R., and to be seconded; Temp. Second Lieut. F. G. Saunders, attached 7th Dragoon Guards, and to be transferred to General List; Temp. Lieut. H. A. Tweedie, General List, from a Flying Officer (Observer); Second Lieut. G. W. E. Baker, Royal Berkshire Regt., and to be seconded; Second Lieut. C. de W. Taylor, 20th Hussars, S.R., from 13th Reserve Regt. of Cavalry; Temp. Second Lieut. H. Pearman, Leinster Regt., and to be transferred to the General List; Second Lieut. D. S. Johnson, Home Counties Divisional Cyclist Companies, Divisional Mounted Troops, T.F.; Second Lieut. C. H. C. Woollven, Devonshire Regt., and to be seconded; Second Lieut. F. H. Hodgson, S.R.; Second Lieut. E. A. de Pass, 3rd County of London Yeomanry, T.F.: May 27.

Second Lieut. S. F. Vincent, S.R.; Second Lieut. (on probation) J. R. Gould, 2nd Regt. King Edward's Horse, S.R., and to be seconded: May 28.

Lieut. W. O. Raikes, East Kent Regt., S.R., from a Flying Officer (Observer); Temp. Second Lieut. F. J. Terrell, Somersetshire Light Infantry, and to be transferred to the General List; Second Lieut. R. S. Capon, Liverpool Regt., T.F., from an Assistant Equipment Officer; Temp. Second Lieut. A. E. S. Story, General List; Second Lieut. W. R. S. Wilberforce, King's Royal Rifle Corps, and to be seconded; Second Lieut. H. R. Hawkins, S.R.: May 29.
 Second Lieut. (temp. Lieut.) W. H. A. Whitworth, Dorset Regt., T.F.: May 30.

Second Lieut. J. B. E. Crosbie, Worcestershire Regt., S.R., and to be seconded; Second Lieut. D. S. Cairnes, Rifle Brigade, and to be seconded; Temp. Second Lieut. G. B. J. Firbank, Welsh Regt., and to be transferred to General List; Second Lieut. W. E. Roe, S.R.: May 31.

Capt. C. R. Tidswell, 1st Dragoons; Temp. Second Lieut. R. J. Sanceau, R.A., and to be transferred to General List: June 2.

Surname of Second Lieut. J. G. McEwan, S.R., is as now described, and not as in *Gazettes* of June 4, 1915, and August 10.

Flying Officers (Observers):

- Lieut. W. R. B. Annesley, R.E., T.F.: October 21.
 Lieut. R. G. Macnaughton, 6th Royal Highlanders, T.F.: May 26.
 Lieut. F. Billings, Manchester Regt., S.R., and to be seconded; Second Lieut. (on probation) G. E. Chancellor, Royal West Surrey Regt., S.R., and to be seconded: May 27.
 Second Lieut. E. R. Davis, Worcestershire Regt., and to be seconded: May 29.
 Temp. Lieut. C. Fairbairn, General List; Temp. Lieut. R. A. Walmisley, A.S.C., and to be transferred to the General List; Lieut. G. W. Panter, Royal Irish Rifles, and to be seconded; Second Lieut. C. W. Short, Indian Army Reserve of Officers; Second Lieut. A. T. Rickards, R.A., and to be seconded; Second Lieut. (on probation) G. Leckie, R.G.A., S.R.; Temp. Second Lieut. T. S. Howe, Connaught Rangers, and to be transferred to the General List; Temp. Second Lieut. H. M. Parsons, General List: May 30.
 Temp. Lieut. E. P. M. Robinson, North Lancashire Regt., and to be transferred to the General List; Lieut. R. Oxspring, Yorkshire Light Infantry, S.R., and to be seconded; Temp. Lieut. J. H. F. McEwen, Cameron Highlanders, and to be transferred to the General List; Temp. Lieut. C. R. Davidson, Argyll and Sutherland Highlanders, and to be transferred to the General List; Lieut. A. C. Maund, 8th Canadian Infantry Bn.; Temp. Second Lieut. G. F. Westcott, A.S.C., and to be transferred to the General List; Temp. Second Lieut. J. B. Tait, Durham Light Infantry, and to be transferred to the General List; Second Lieut. S. A. Villiers, R.A., and to be seconded; Second Lieut. H. S. Macneil, R.F.A., S.R.; Temp. Second Lieut. L. D. Brown, Motor Machine Gun Service, and to be transferred to the General List; Temp. Second Lieut. M. C. Breese, North Staffordshire Regt., and to be transferred to the General List: May 31.
 Lieut. (temp. Capt.) E. E. N. Burney, Royal Berkshire Regt., and to be seconded: June 1.

Balloon Officers:

- Lieut. P. G. Bateman, London Regt., T.F.: May 21.
 Second Lieut. L. F. G. Spencer, Seaforth Highlanders, S.R.: May 22.

Assistant Equipment Officers:

- Second Lieut. A. N. Patterson, S.R.: January 20.
 Temp. Second Lieut. T. F. G. Strubell, General List: January 31.
 Second Lieut. E. D. L. Davies, S.R.: February 14.
 Second Lieut. A. T. Thompson, S.R.: February 15.
 Temp. Hon. Lieut. R. Watson, A.S.C., and to be transferred to the General List as Temp. Lieut.: February 18.
 Second Lieut. C. R. Fry, S.R.: February 21.
 Second Lieut. H. L. Saunders, S.R.: February 29.
 Temp. Capt. F. R. Williams, South Staffordshire Regt.; and to be transferred to the General List; Qmr. and Hon. Lieut. L. Newman, City of London Yeomanry, T.F.; Second Lieut. J. A. O'Brien, London Regt., T.F.; Second Lieut. (on probation) R. L. Brancker, S.R.: March 29.
 Temp. Second Lieut. W. J. Cooper, General List: March 30.
 Second Lieut. (on probation) K. A. C. Creswell, S.R.: April 4.
 Second Lieut. C. H. Whittington, S.R.: April 11.
 Second Lieut. (on probation) H. W. Mills, S.R.: April 12.
 Temp. Lieut. W. B. Cushion, 22nd Manchester Regt., and to be transferred to the General List: April 13.
 Second Lieut. J. E. Appleyard, S.R.: May 16.
 Second Lieut. T. C. Thrupp, S.R.; Temp. Second Lieut. J. H. Mackie, General List: May 20.
 Temp. Second Lieut. T. C. Noble, General List; Second Lieut. A. H. Chapman, S.R.: May 25.
 Temp. Second Lieut. K. G. F. Collender, General List; Second Lieut. A. N. Buchanan, S.R.; Second Lieut. D. R. Stitt, S.R.: May 29.
 Second Lieut. L. J. Pearce, S.R.: May 30.
 Temp. Second Lieut. A. S. Ellerton, General List; Temp. Second Lieut. R. Cook, General List: June 1.
 Second Lieut. R. W. B. Billingham, S.R.: June 13.

Second Lieuts. to be Temp. Lieuts. whilst serving with R.F.C.:

- A. Lees, Royal West Kent Regt.; L. H. T. Sloan, Cameron Highlanders; P. F. J. Kent, 3rd Dragoon Guards; F. M. I. Watts, Worcestershire Regt.; J. M. J. Kenny, A.S.C.; W. L. Mills, R.F.A.; R. R. Money, East Yorkshire Regt.; G. F. Knight, Devonshire Regt., S.R.; J. W. Halcrow, Dorsetshire Regt., S.R.; T. F. Lucas, Royal Warwickshire Regt., S.R.; D. G. Prentice, Worcestershire Regt., S.R. (on probation), G. W. Roberts, R.F.A., S.R.; C. A. Pelham, 11th Hussars, S.R.: May 1.

To be Temp. Second Lieuts. for duty with the R.F.C.:

- Leading Mech. S. R. Axford, from R.N.A.S.: May 22.
 Pte. E. A. Gulson, from Inns of Court O.T.C.: May 25.
 Pte. G. Knight, from 3rd County of London Yeomanry, T.F.: May 27.
 Lance-Corp. K. G. F. Collender, from R.A.M.C., T.F.: April 3.

- Serg. R. G. McMurray, from Royal Irish Rifles; Serg. F. P. Kane, from Canadian Local Forces; Serg. C. G. H. Wadleigh, from Canadian Training Division; Serg. G. H. Raitt, from Canadian Engineers; Serg. V. B. Allen, from Canadian Local Forces; Cdt.-Serg. J. H. Sayer, from Whitgift Grammar School O.T.C.; Corp. W. H. Farrow, from R.E.; Corp. A. G. C. W. Faulkner, from 61st Canadian Infantry Bn.; Corp. H. G. W. Debenham, from Winchester College O.T.C.; Corp. H. G. C. Bowden, from R.E.; Lance-Corp. G. Edwards, from 3rd City of London Yeomanry, T.F.; Gnr. I. V. Pryott, from Motor Machine-Gun Corps; Dvr. J. S. Davis, from H.A.C., T.F.; Pte. H. E. K. Eccles, from University of London O.T.C.; Pte. L. E. J. Lonnen, from H.A.C., T.F.; Pte. C. G. Baker, from a Provisional Bn., T.F.; Pte. J. V. Aspinall, from Worcestershire Regt., S.R.; Pte. F. B. Luget, from 2nd Co. of London Yeomanry, T.F.; Pte. F. H. Reynell, from 1st City of London Yeomanry, T.F.; Pte. A. W. S. Molineaux, from South Staffordshire Regt., T.F.; Pte. C. de Frece, from 1st County of London Yeomanry, T.F.; Cdt. A. W. Smith, from Artists Rifles O.T.C.; Cdt. G. H. Cock, from Artists Rifles O.T.C.; Lce.-Corp. S. L. Pope, Lce.-Corp. W. Cochrane, Pte. C. E. Ward, Pte. A. H. Fenton, Pte. F. W. Michell, Pte. A. E. Bowen, Pte. A. J. Fisher, Pte. D. Coates, Pte. P. S. Joyce, Pte. J. L. Tibbetts, Pte. I. E. M. Mackenzie, all from Inns of Court O.T.C.: June 3.

- Corp. J. L. Trollope, from R.E.; Corp. G. F. Lines, from No. 1 Reserve, M.T. Depot; Corp. C. C. Gibbs, from 3rd City of London Yeomanry, T.F.; Gnr. A. C. Day, from Sussex R.G.A., T.F.; Spr. E. P. Wilmot, from Australian Engineers; Pte. F. A. H. F. Perks-Morris, Pte. R. W. Chappell, Pte. F. M. Capiter, all from Inns of Court O.T.C.: June 17.

The undermentioned N.C.O.'s and Men to be Temp. Second Lieuts. on probation, for duty with the R.F.C.:

- Lance-Corp. D. Clarke, from H.A.C.: May 6.
 Corp. G. H. Wood, from Middlesex Regt.: May 9.
 Corp. D. P. Cox, from Machine Gun Corps; Pte. L. W. B. Parsons, from H.A.C.: May 15.
 Corp. G. T. Richardson, from R.E.; Lce.-Corp. C. Murchie, from A.S.C., Pte. F. W. Rennie, from A.S.C.: May 16.

To be Temp. Second Lieuts.:

- Gnr. J. K. Mountain, from Australian Field Artillery, for duty with R.F.C.: May 15.
 Flight Serg. G. F. F. Collender, from R.F.C., for duty with the Military Wing of that Corps: May 19.
 Flight Serg. G. F. Drudge, from R.F.C., for duty with Military Wing of that Corps: May 28.
 E. J. Sampson, whilst employed as Interpreter: June 1.

To be Temp. Second Lieut. (on probation):

- G. Cullis: May 29.
Hampshire Aircraft Parks
 T. G. Waterhouse, to be Second Lieut.: June 14.

SPECIAL RESERVE

- J. H. Simpson, from Lieut. attached 5th Canadian Infantry Bn., to be Lieut.: May 1.

Second Lieuts. (on probation) confirmed in their rank:

- G. L. Faulkner, L. C. Boyd, G. E. Hewson, L. J. Pearce, F. H. Hodgson, H. R. Hawkins, S. F. Vincent, G. H. E. Rippon (since deceased), E. M. Smith, C. H. Whittington, W. E. Roe, C. St. G. Campbell, R. L. Brancker, H. W. Mills.

To be Second Lieuts.:

- G. B. Redgrave: June 5.
 R. W. B. Billingham: June 13.

To be Second Lieuts. (on probation):

- K. A. C. Creswell: April 3.
 A. N. Appleford, H. E. L. Pilbrow: May 11.
 A. J. M. Ross: May 17.
 H. G. Gibbs, G. P. Achurch: May 22.
 H. B. Dresser, T. G. Mellanby: May 23.
 H. B. Neame: June 2.
 H. J. Whittingham, A. Brown, J. F. MacKinnon, H. V. Phippen, A. B. Vallance, W. M. Kent, L. W. Wood, E. E. Erlebach, H. E. Steinberg, E. M. Milling, L. W. White, N. B. Hair, A. A. McNeil, G. L. Rodwell, H. Stroud, E. P. Lyon, C. L. Milburn, S. C. Mayton, W. H. Douche, N. E. Chandler, V. T. Norminton, A. Carruthers, H. H. Griffith, H. E. Startin, A. R. Crisp, R. W. Cross, P. G. Robinson, E. D. Abbott, R. A. B. Hall, W. T. Hall, E. H. Wingfield, D. A. Macneil, J. B. Ackroyd, W. B. Wood, C. L. Baldwin, H. A. Howell, B. James, G. F. Hughes, A. N. Bengie, V. H. Collins, A. E. M. Jansen, H. W. Sellars, J. S. Mitchell, G. K. Webb, M. Hughes, R. S. Larkin, W. T. B. Tasker, F. L. Luxmoore, W. D. B. Taylor, W. R. Bowick, G. H. Jacob, R. M. Neill, F. H. Gay, E. G. C. Oulter, A. G. Jarvis, N. E. S. Simon, C. C. White, G. A. Giles, M. Sharp: June 3.

The following Second Lieuts. (on probation) relinquish their Commissions:

- R. W. Catto, H. G. Smith, G. P. Ham, J. L. Dashwood: May 24.
 P. R. Stirling: June 3.

LEST YOU FORGET!

There are few things that bring greater joy to the heart of man than a really efficient and decently-planned pocket book of the variety intended for usefulness rather than for ornament. Moreover, as a keepsake it has the merit of being in constant use. A pocket book approaching very near to the ideal (which, of course, is unattainable) has recently been issued by the Fairby Construction Co. It is based on the loose-leaf principle duly indexed. Its get-up is irreproachable, its format leaves nothing to be desired. The supply is apparently limited, hence let our readers be advised to apply without delay.

OXY-ACETYLENE WELDING

The development of the aircraft industry has given an enormous impetus to oxy-acetylene welding, wherefor contractors should note that among firms that specialise in oxy-acetylene welding and cutting, Imperial Light, Ltd., of Victoria Street, London, S.W., a controlled establishment, occupy a foremost place. The firm furthermore makes a speciality of various fluxes, a point whose importance will be readily appreciated as an enormous advantage is gained by using the highest quality of flux in place of cheaper and inferior qualities.

SPEECH REGAINED THROUGH AEROPLANE

Another case of the sudden recovery of the power of speech by a soldier who had lost it through shell shock has occurred at a Brighton military hospital. While the man was sitting in the grounds of the Dyke Road Hospital, an aeroplane was observed flying very low, and it landed in a playing field close by. The man was so alarmed at the prospect of an accident that he shouted out, and he has been able to talk normally since.

AIR MECHANIC'S ESCAPE

Air Mechanic Wilson, R.N.A.S., was saved from the *Queen Mary* when she was sunk. When the *Queen Mary* went down Wilson was picked up by the *Tipperary*, which sank soon after he got on board. He was eventually picked up by our own boats and brought to England suffering from a wound on the hip.

R.N.A.S. MECHANICS WANTED

Erectors, constructional fitters, scaffolders, bricklayers, and sheeters are required at once for the Royal Naval Air Service for the duration of the war. They will be rated as air mechanics with pay up to 4s. a day, in addition to uniform and separation allowances. Applications, with testimonials, either personally or by letter, should be made to the Recruiting Offices, R.N.A.S., Brook Green, Hammersmith, W.

SOCIETY OF MOTOR MANUFACTURERS AND TRADERS

A meeting of the Pneumatic Tyre Committee of the above Society was held on June 5, when there were present: Mr. T. H. Woollen (in the chair), and Messrs. G. W. Beldam, S. Browne, F. Davies, and C. T. Mabey. In attendance, the Secretary.

Aeroplane Tyres—The Secretary reported on his interview with the Admiralty. From this it appeared that since experiments could not be carried out at the present time, the only type of wheels and tyres likely to be accepted during the war would be that now in use. Consequently, it appeared that the only possible way for other manufacturers to be able to supply at present would be to manufacture under licence from the company now supplying.

BOOK RECEIVED

"LEARNING TO FLY." C. Grahame-White and Harry Harper. London: T. Werner Laurie, Ltd., 1916. 110 pp., illus. Price 2s. 6d.

PATENT INFORMATION

This list is specially compiled for AERONAUTICS by Messrs. Rayner and Co., Registered Patent Agents, of 5, Chancery Lane, London, from whom all information relating to Patents, Designs, Trade Marks, etc., can be obtained gratuitously.

LATEST PATENT APPLICATIONS

- 7,271 S. Diggle. Propellers and tractors for aerial or marine propulsion or traction. 22/5/16.
- 7,287 W. F. Saunt. Aerial machine. 22/5/16.
- 7,467 A. F. Nalder. Packing-case for transport of aircraft, etc. 25/5/16.
- 7,479 L. Coatalen. Cooling aeroplane engines. 26/5/16.
- 7,526 E. G. Eyles. Means for facilitating safe landing of aeroplanes, etc. 26/5/16.
- 7,532 W. H. Harvey. Aeroplanes. 27/5/16.
- 7,596 C. G. Pullin. Universal joints for gun supports on aircraft, etc. 29/5/16.
- 7,738 C. Macbeth. Aeroplane wheels. 30/5/16.
- 7,822 Blackburn Aeroplane and Motor Co. Aeroplanes. 2/6/16.
- 7,871 J. Fitzgerald. Aircraft. 3/6/16.

SPECIFICATION ACCEPTED THIS WEEK

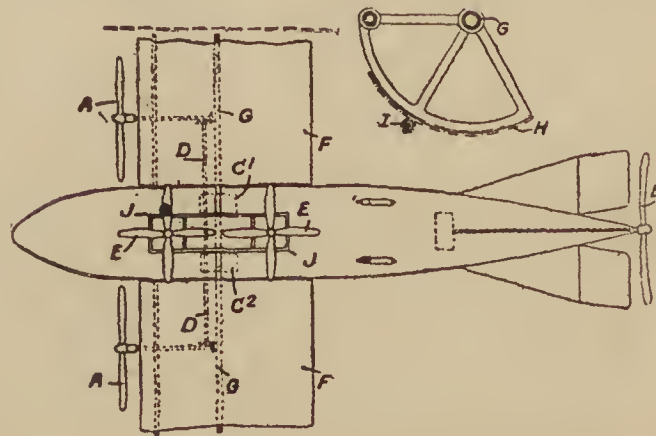
- 11,466 Massis. Aircraft.

SPECIFICATIONS PUBLISHED THIS WEEK

- 11,466 Massis. Aircraft.
- 14,713 Walker. Flying machines.

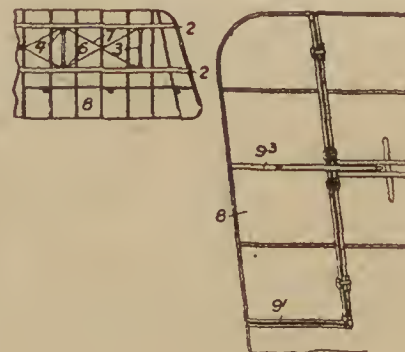
LATEST PUBLISHED ABSTRACTS

- 2,046 "Aeronautics." F. de B. Greenwood, 316, New Chester Road, Birkenhead. An aeroplane having traction propellers and helicopters, with or without a thrust propeller *B*, has the tractors *A* driven by bevel gearing from a shaft *D* to which the motors *C*¹, *C*² may be clutched. The helicopters *E* are driven from the same shaft *D*, one clutch being employed for changing from helicopters to



tractors. The helicopters are mounted on a tower structure / of vertical rods stayed together, the tractors being carried by the fuselage. The plane or planes *F* are mounted on central shafts *G* provided with segmental racks *H*, Fig. 4, with which pinions *I* engage for the purpose of altering the inclination of the planes. The pinions *I* are driven from the shaft *D*.

- 2,420 "Aeronautics." R. Haddan, 31, Bedford Street, Strand, London. The spars 2 of the planes of aeroplanes are connected by steel tubes 3, which are secured to sleeves 4 having flanges 6, whereby they are fixed to the spars and



to which the diagonal ties 7 are connected. The balancing-flaps 8 have a helical twist upwards from the inner edge 9¹ to the outer edge. The operating cords are secured to the central rib 93, which extends inwards beyond the axis of rotation of the flap.

Printed copies of the specifications can be obtained from Messrs. Rayner and Co., at the price of 1s. each.

NEW COMPANIES REGISTERED

AIRCRAFT SUPPLIES CO., LTD.—Capital £12,500, in 10,000 cumulative preference shares of £1 each and 5,000 ordinary shares of 10s. each. Acquiring business carried on by G. H. Mansfield at 17, John Street, Theobald's Road, W.C., as the Aircraft Supplies Co. Managing director, G. H. Mansfield.

M. T. GUNSIGHT CO., LTD., 7, Union Court, Old Broad Street, E.C.—Capital £1,200, in £1 shares. Acquiring a patent to be granted to H. Cahen relating to improvements in the manufacture of anti-aircraft gunsights (provisional protection No. 15,095 of 1915). First directors, Lieutenant-Commander H. T. Smith-Dorrien, R.N. (retired), and H. M. Hilbery.

TORBINIA ENGINEERING CO. (1916), LTD., Regent House, Kingsway, W.C.—Capital £35,000, in 15,000 8 per cent. cum. pref. shares of £1 each and 400,000 ordinary shares of 1s. each. Manufacturers of munitions of war, transport motor cars, cabs, etc. Under agreement with the Torbinia Engineering Co., Ltd., and F. L. D. Snell, the liquidator thereof. First directors, Oscar Lewisohn, E. J. Macnamara, W. F. Ladenburg, and L. V. Rothschild.

AERONAUTICS

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(FOUNDED 1907)

Edited by JOHN H. LEDEBOER, B.A., A.F.Ae.S.

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as a Newspaper]

ONE PENNY

A PRESSING QUESTION

THERE has lately been much discussion, about it and about, regarding the organisation of British industries and the development of British commerce—after the war. If one is permitted to form a dispassionate estimate of the results of the Economic Conference lately brought to an issue in Paris, it is the evident intention of the countries concerned, first and foremost, to limit trade with the ring of enemy countries, and secondly to promote commercial relations and free interchange among the nations constituting the Entente. With the wisdom of this compact in its general principles we have no concern; whether it is feasible in peace practice we doubt, for is the laxity of the blockade not there before our eyes as a shining example of theory as against mundane practice? But the object in view is praiseworthy enough. Moreover, under the conditions now existing in the aeronautical industry and those likely to prevail after the conclusion of peace and subsequent to the re-inception of the international trade war, there is bound to ensue a period of the gravest industrial uncertainty, which calls for the most active preparation at the present time if it is to be met adequately.

* * *

Needless to say, under the present stress of war requirements, the industry is enjoying a period of prosperity which can only be designated as artificial. With the end of the war its shackles will automatically fall off, and once again the aeronautical industry of Great Britain—and, as we may justly hope, of the Empire at large—will be free to stand or fall on its own intrinsic merits. With present neutral countries we need not concern ourselves in this respect—save one; the subject of trade relations with the Allies is too thorny to be dealt with at the moment. Even supposing that trade with the present enemy is scotched for years to come—and the assumption is a large one—we may be perfectly sure that they will find means to dispose to us of their surplus products. For the present and for years hereafter we have here solely to examine the position of the British aviation industry as against possible competitors and to devise the means requisite to safeguard its interests.

* * *

Consider the position. In all the belligerent countries there have sprung up vast arsenals feverishly producing aeronautical material to the utmost extent of conceivable possible output. Whole cognate industries have been mobilised and transformed for the purpose. Our own output being insufficient to supply to the full our own needs and the requirements of some of our less fortunately situated Allies, we have had—and very properly too—recourse to the manufacturing resources of neutral countries. And all this for the purposes of war, to which, while it lasts, all other considerations must for the time being be subordinate. Suppose, now, that with the conclusion of peace this extraordinary demand for supplies suddenly ceases—or, at all events, the major part thereof, since it is impossible to conceive of the nations completely disarming at the swish of a

magician's wand—is it to be expected that the great thriving aircraft industry will likewise give up the ghost or at best pursue its previous attenuated and precarious existence? Assuredly not; for once a great industry has been called into being and has been built up on a sound foundation it will, imbued with the ineradicable will to live, strive its utmost to find an outlet for its activity. Which is a truth that applies not only to Great Britain, but to other countries just as well.

* * *

Let us be quite clear on this point, for it vitally concerns the entire future of our aircraft industry, which is on a totally different plane to most other industries, in that it provides a supremely important part of the nation's war material, or, in other words, forms an integral factor in the scheme of our national defence. Hence it must on that account come in for special treatment, if needs be, since ordinary merely fiscal considerations do not apply. This truth was clearly grasped both in France and in Germany years before the outbreak of war, and accordingly Government stepped forward in both cases with lavish subsidies, either disguised or frankly handed out, with the sole object in view of fostering the status and productive capacity of the industry, under which terms we may include the formation of engineers, pilots, and mechanics, as well as the provision of material.

* * *

But the British industry at no time received a subsidy in any shape or form; its very existence was barely acknowledged. Such success as it achieved was built up purely on private endeavour and initiative. Now every nation, fondly clinging to its traditions, has its own peculiar method of encouraging or otherwise its industries. Direct State-subsidy has never found any favour among us, and we do not ask for it now, nor will in the future. Still, stark facts must be faced, and it has once again become urgent, since there yet remain a few days to reconsider the matter, to draw attention to the serious position in which the aircraft industry, under which term we may include the formation war, if not before, if the present policy of the Government in regard to it is persisted in.

* * *

Let us take an analogous case. In the United States the aviation industry—Heaven knows!—has never received official recognition, let alone subsidy. If to-day it flourishes apace this is due entirely to orders from the Allies and, in a very minor degree, from neutral countries. So does the British industry, but with this supremely important difference, that, as things stand at present, British firms will be called upon to pay over to the Exchequer fully three-quarters of their net working profits, irrespective of the machinery and plant they have laid down in view of increased productive capacity, and which have probably absorbed the greater part of such profits. On the other hand, neutral firms have not only built up their present

plant solely as a result of our orders, but, being free of any tax in this respect, will be free after the war, and even during its continuance, to swamp our markets. And thus the extra taxes levied upon our industry will be indirectly applied to subsidise its competitors. It is just as well to state the matter now in the plainest possible terms, since the logic of the situation is irrefutable.

* * *

Let it be stated once and for all that there is no British aircraft firm but is not willing to do its share to the uttermost in supporting the country's financial burden, that there exists not a single firm in these isles but would be content with a most mediocre profit. Let it be added that there is scarcely a firm that has not invested by far the greater proportion of such profits as it has made in the purchase and laying down of new plant, with the sole object of furthering its output both in quantity and quality. The trouble is that the Government seems to be imbued with the notion that the production of aeroplanes is on a par with the running of a grocer's shop: a customer plunks down his eleven-three on the counter and receives the finished article in exchange, neatly wrapped up in brown paper. Do you—O gracious customer—ever realise the work that goes on

behind the scenes; the laborious and costly experiments extending over years, the serried ghostly ranks of dud experimental machines that have come to an untimely end, row upon row, until the finished article is brought into being, which you so patriotically watch as it gracefully twists and twirls above some pleasure flying ground? Think you ever of the life's blood that has been shed in bringing it into the perfection of its being?

* * *

This, therefore, briefly summarised, is the position at present. The industry is faced with a ruinous taxation of its so-called profits; and will thereby be inevitably crippled by its more fortunate competitors either when peace is declared, or before if the war drags on. From this disability its competitors are immune. The result is too obvious to require emphasising. Yet the industry, relying upon its own merits, will cheerfully face the future provided it is granted an opportunity to expand, provided that it may be allowed to re-invest its own earnings into its business for the further extension of what one day will prove one of the deciding factors in our national defence. Only, the matter is urgent. . . .

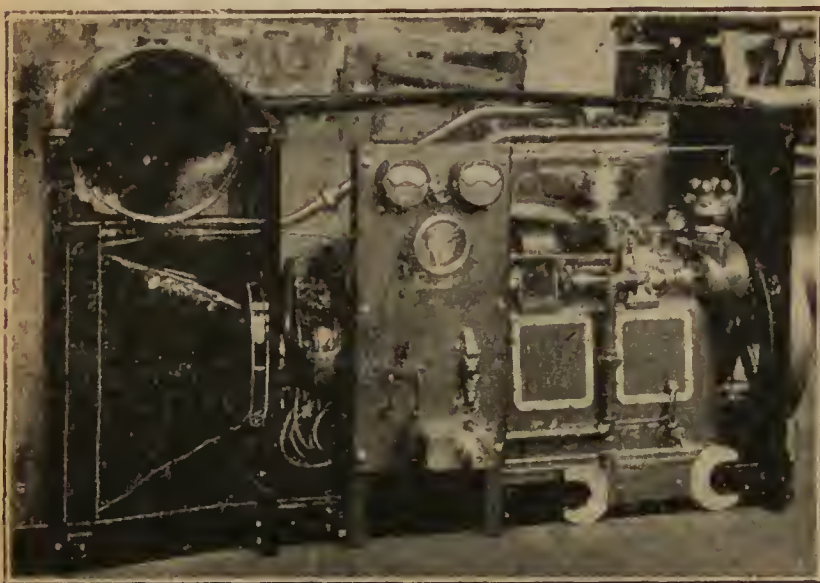
J. H. L.

STURTEVANT GASOLENE GENERATING SETS

THE B. F. Sturtevant Co., of Hyde Park, Mass., are manufacturing portable electric generating sets of a special type, that are particularly adapted for use in aeronautical training camp hangars, shops, etc., supplying electricity for lighting and power purposes. Several of these outfits have been ordered for the Advance Base Marine service in the U.S. Navy. The U.S. Signal Corps Aviation School, located at San Diego, California, are using one of these generating sets with great success.

These sets are intended to be used in direct connection with lighting and power circuits, and not through a storage

ing set consists of a Sturtevant direct current electric generator directly connected to a Sturtevant gasolene engine, including a switchboard and gasolene tank. A special type of disc fan is mounted on an extension of the generating shaft, and arranged to blow air through a cellular type radiator. All of this apparatus is mounted upon two channel irons, and the engine generator and switchboard are covered by a sheet-metal hood, arranged similarly to an automobile hood. The engine is of the four cycle, water-cooled, vertical type, with either four or six cylinders, according to the size of the unit.



STURTEVANT GENERATING SET

battery, although they may be so arranged if desired. Superior design, high-grade workmanship, and a particularly efficient governor control insure a constant voltage through wide variations of load. The Sturtevant generating sets were built to supply a demand for an electric generating set that would be easy and inexpensive to operate; one that would not require the services of an experienced engineer in constant attendance, and which could easily and readily be transported from one place to another.

Described briefly, the Sturtevant portable electric generat-



PORTABLE GASOLENE ELECTRIC GENERATING SET

These sets are built in three sizes, five, ten, and fifteen kilowatts capacity, capable of lighting 200, 400, and 600 twenty candle power tungsten lamps. A long stroke engine has been designed as the most efficient and practical for this service. Both engine and generator are capable of operating under an overload of 25 per cent. for two hours.

The same type of generator that has been so successfully used in connection with Sturtevant steam engines for the United States Navy, merchant marine, and other high-grade requirements is used with these gasolene power units.

ON THE ELEMENTARY DESIGN OF AEROPLANE ENGINES

By JOHN WALLACE

In view of the large influx of new pilots and mechanics of every grade into the ranks of the Air Services, to the vast majority of whom the aero engine comes as a mysterious novelty; in view, moreover, of the almost total lack of available literature dealing with the more elementary branches of the subject, we have no doubt that this series of articles on the elementary design of aero engines will prove of widespread interest. The ensuing articles will prove to have been written from a thoroughly practical and utilitarian standpoint, and it is hoped that they will prove a reliable and useful guide to the elements of present-day engine design.—ED.

AS I believe there exists a growing demand among air-mechanics of both of the Flying Services for some technical knowledge of aeroplane motors, I propose to endeavour to treat in a general and in as elementary a manner as possible the principles underlying the design and construction of aeroplane engines.

It is, perhaps, hardly necessary to state that these notes are not intended as a "Standard Work" on the design of petrol engines, but should rather be regarded in the light of "A Child's Guide to Aeroplane Motor Design."

So far as I am aware, there are not more than two books yet published which are of any use to the ordinary air-mechanic desiring information on this very important subject. Of course there are several text-books for the use of technical men, whose business it is to design engines; but as the first pages of these volumes usually contain a series of such terrifying hieroglyphics as

$$\left(\frac{x}{y} \int \frac{dp}{z} \log \frac{V_0}{3.1} \right) = \text{a constant,}$$

the ordinary human being, very naturally, shuts the book with a bang and never again thinks of attempting to wade through its contents. However, having a very limited knowledge of mathematics myself, it will be to my own interest to employ only the most elementary arithmetic and algebra right throughout these articles.

Of course it is assumed that the reader understands the principles upon which the ordinary petrol motor works, and that he is able to differentiate between such things as a side-valve engine and one of the over-head-valve type.

The primary matter to be considered in the design of an aeroplane engine is first of all the power to be available at the propeller-shaft, and consequently the size of engine necessary to develop this power. Now in order to accomplish this one must have some sound practical basis to work upon. Many and various are the formulæ which are supposed to give one a good idea of the power which any engine will develop; but for our purpose the only satisfactory basis to work upon is that of the cylinder capacity of the engine—that is to say, the total volume swept out by the pistons. Now a fair assumption for any decently designed engine is that it will develop 10 horse-power for every litre (1,000 ccs.) of its total capacity.

A large number of engine manufacturers appear to use some very unsatisfactory means of rating the horse-power of their motors, for either the rated power is a little on the low side, or—what is much more common—the rated horse-power is greatly in excess of the power actually available at the propeller-shaft. Moreover, when a new motor is first marketed, the manufacturers are very loth indeed to give any accurate information as to the actual power on test, speed of revolution, fuel consumption, weight, etc. Consequently the aeroplane designer wishing to use one of these engines is greatly handicapped in the matter of his calculations, and, as a result, his expectations with regard to the performance of his machine frequently suffer some rather rude shocks. The usual cause of this is that the realised power and weight of the engine prove much inferior to what the designer of the aeroplane had been led to believe. Why on earth the engine manufacturer is so unwilling to part with such general information is totally beyond my comprehension. A friend of mine, designing a propeller,

naturally required a horse-power and speed of revolution curve of the engine for which the propeller was being designed; yet although this engine had been on the market for over two years, it was only after a great deal of trouble and delay, and many conversations over the telephone, that the required curve was obtained.

Now behaviour of this sort on the part of any commercial concern in so new a thing as aviation is most undesirable, for it is obvious that rapid progress cannot be made without a certain amount of friendly co-operation on the part of everybody concerned. It is absurd to suggest that information of so general a character can possibly be of any assistance to our enemies; on the other hand, if such results are obtained as to be extraordinarily good, then their advertisement would merely have the effect of making "hostile designers" rather uncomfortable. It is the means of obtaining the performance which must be kept secret, not the performance itself.

Knowing the power which is required from the proposed engine, and the size of engine necessary to give this power, it will now be necessary to decide upon the general lines of the design, such as the number and disposition of the cylinders, and the means of cooling to be employed. With regard to this latter question of cooling the cylinders, it is reasonable to state that, disregarding motors of the rotary type, water-cooling is the only satisfactory system at present devised. Cooling by air is most unsatisfactory, except for very small engines, unless a heavy, cumbersome, and expensive system of fans and casings be employed; and even then the cooling is very uneven and irregular.

Water-cooling having been decided upon, provision will have to be made for a water pump, or possibly for two. The thermo-syphon system, though beautifully simple, depends upon gravity for its action; and as an aeroplane power plant must be capable of running in any position whatsoever, even upside down, any apparatus which is dependent upon the force of gravity for its action is totally unsuitable. It is sufficient for the moment to know that the engine will need to be water-cooled, for the actual details of the system will be dealt with later.

The next consideration will be the number and disposition of the cylinders. Owing to the even torque, smooth running, and absence of vibration, which are essential, the least number of cylinders which it is desirable to employ on a single-acting aeroplane engine is four. Now, although it is possible to obtain nearly perfect balance of the moving parts of a four-cylinder engine, in practice it is impossible to dispense with a fly-wheel, owing to the fact that the four pistons reach the ends of their strokes simultaneously—that is to say, the pistons come to a standstill and have to be immediately accelerated in their respective opposite directions at precisely the same moment for all four. As the inertia of the crank-shaft and other revolving parts is not sufficient to do this work, a fly-wheel of sufficient diameter and weight must be employed. Now, of course, a fly-wheel means extra weight of metal which is not productive of power, and consequently it will be of great advantage if its employment be made unnecessary. In order to do so, it is merely necessary to increase the number of cylinders to six, in which case not only are there never more than two pistons reaching the ends of their strokes together, but also the working

stroke of one piston is succeeded by that of the next before the effective expansion of the gases acting on the first piston is complete. Thus it will be seen that the power impulses of a six-cylinder engine overlap, with the result that a very smooth-running and flexible motor is obtained, with which the use of a fly-wheel is unnecessary. Of course, the use of still more cylinders will give even better results in this direction, notably in the case of the twelve-cylinder engine,

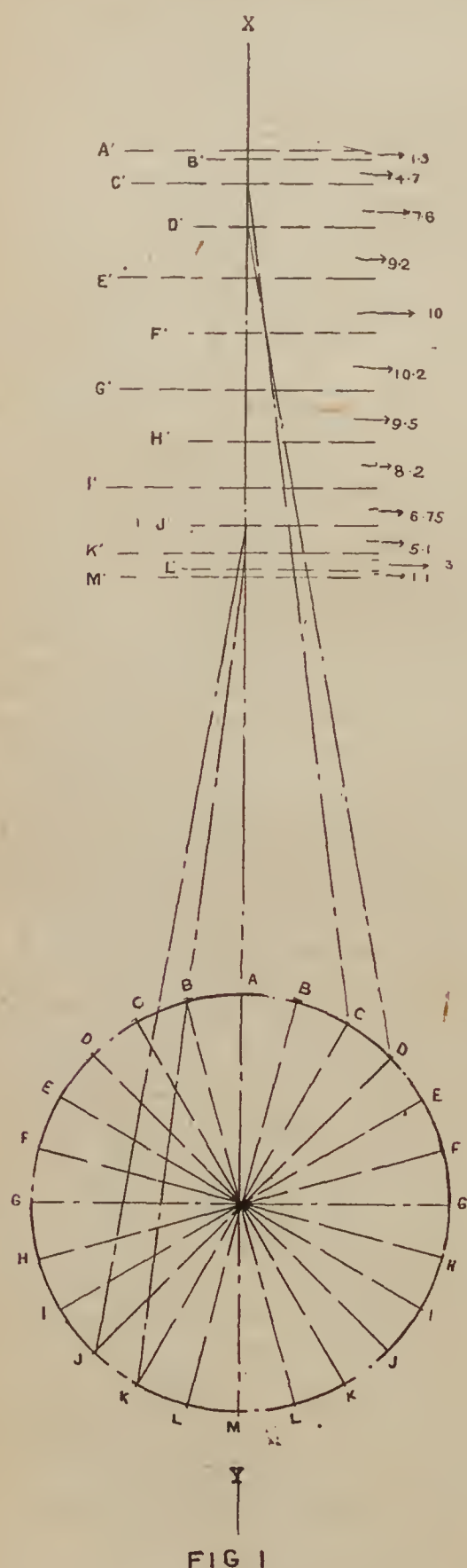


FIG 1

which type is dealt with at some length later on in these articles. Reverting to the four-cylinder engine, it would appear at first sight that it were possible to obtain perfect balance of the reciprocating parts in this type, but this is not so; and as the reason for this being impossible is little known outside technical circles, it will perhaps not be out of place to give a short and elementary explanation here.

In Fig. 1 a diagram is shown of the relative motions of the gudgeon-pin with regard to the crank-pin of an engine,

the stroke of which is 3 in. (76.2 mms.), the length of the connecting-rod centres being 6 in. (152.4 mms.)—that is to say, twice the length of the stroke. The angles marked off on the crank-pin circle are each 15 degrees, so that when the crank-pin moves from *A* to *B* or *C* to *D*, and so on, it moves through an angle of 15 degrees in each case. The line *XY* represents the vertical axis of the cylinder, and on this line are marked off *A'*, *B'*, *C'*, etc., which points represent the position of the gudgeon-pin centre when the centre of the crank-pin is at *A*, *B*, *C*, etc., respectively.

Now, when the crank-pin moves from *A* to *B*, and in consequence the gudgeon-pin moves from *A'* to *B'*, it will be observed that this vertical distance, *A' B'*, is greater than the vertical distance *L' M'*, which latter is the movement of the gudgeon-pin when the crank-pin moves from *L* to *M*, in spite of the fact that the angles *A* to *B* and from *L* to *M*

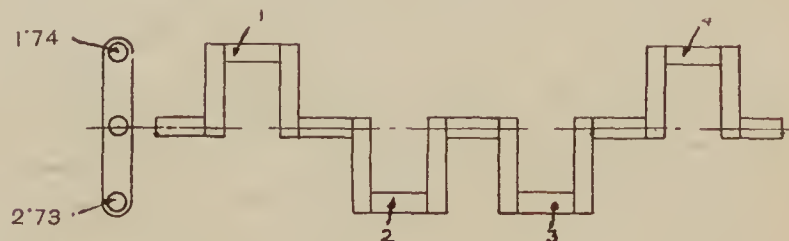


FIG 2

are precisely equal. In the first case the vertical distance is 1.3 mms., whereas in the movement from *L* to *M* the vertical distance is only 1.1 mms., the difference being .2 mms. It will also be noted that in the case of the crank-pin moving from *C* to *D* the vertical distance *C' D'* is 2.5 mms. greater than the distance *K' J'*, which latter is the distance moved through by the gudgeon-pin when the crank-pin travels from *K* to *J*, which last is the movement corresponding to that from *B* to *C*. In this case it will be noticed that the difference is very marked indeed. Now, the reader should acquaint himself most thoroughly with this diagram, inasmuch that the effects therein illustrated have a very important bearing upon the balance of an engine.

Referring to Fig. 2, the reader will doubtless remember that in a four-cylinder engine of the vertical type the crank-pins 1 and 4 are in line, and that they are arranged at an angle of 180 degrees to crank-pins 2 and 3, which pair are also in line. So it will be apparent that when the cranks 1 and 4 are moving from *C* to *D*, on the right-hand side of the diagram, crank-pins 2 and 3 will be moving from *K* to *J* on the left-hand side; hence it follows that, whereas cranks 1 and 4 cause the pistons, which are attached to them by their connecting-rods, to move from *C'* to *D'* = 7.6 mms., the crank-pins moving from *K* to *J* move *their* respective gudgeon-pins and pistons from *K'* to *J'*, which distance is only 5.1 mms. Now, of course, as the distances *C' D'* and *K' J'* are both moved through in the same period of time, and that as *C' D'* is greater than *K' J'*, then it is obvious that the pistons attached to crank-pins 1 and 4 must during that period travel faster than the pistons attached to 2 and 3; from this it follows that pistons 1 and 4, on reaching *D*, possess greater kinetic energy than the pistons 2 and 3 on reaching *J*. Now, if we assume some speed of revolution of the crank-shaft and a weight for the pistons, we can determine whether this difference is worth considering.

First of all assume, for the sake of convenience, that the weight of the pistons is one pound each, and then we will roughly calculate the difference in kinetic energy between the two sets of pistons when the crank-shaft is revolving at 500 r.p.m.

The pistons 1 and 4 move through 7.6 mms. (.275 ins.) in .005 seconds, so that their velocity is 4.58 ft. per sec. Then their kinetic energy = $\frac{1 \times 4.58 \times 4.58}{64.4} = .326$ lbs. In the same

way pistons 2 and 3 move through 5.1 mms. (.2 ins.) in the same length of time, so that their velocity is 3.34 ft. per

see., and their kinetic energy is 172 lbs. The difference between the two is therefore 154 lbs., and such a force would appear to be negligible. But if the engine were accelerated to 2,000 r.p.m., then in the case of pistons 1 and 4 the velocity would then be 18.32 ft. per sec., and K.E. (kinetic energy) 5.22 lbs.; while the velocity of pistons 2 and 3 would be 13.34 ft. per sec., and their K.E. 2.77 lbs. each. Thus the difference in kinetic energy would then be 2.45 lbs.; but as the pistons are arranged in pairs, then, in a four-cylinder engine of the above dimensions, there would exist an unbalanced force of 4.9 lbs. when the crank-shaft was turning over at 2,000 r.p.m., a force that would be by no means negligible. Now pistons of the weight which was assumed in the foregoing example would in the ordinary way only occur in a very small engine—say of 3 in. bore. In the case of a larger engine, such as one of 6 in. bore and 7 in. stroke, not only the weight of the pistons, but also the piston speeds and the difference in kinetic energy would be very much greater indeed, and that largely accounts for the fact that engines of only four cylinders are never used on aeroplanes for very large power outputs.

I am afraid that, owing to my poor literary attainments,

(To be continued)

A NEW AMERICAN DIRIGIBLE

From a Correspondent

THE eyes of a portion of the aeronautical world have lately been focussed on Southern California, where interesting flights in balloons have been made and the construction of a military dirigible has been announced. Russell and William Waterman, under guarded secrecy, have constructed a dirigible which is 124 ft. long and 30 ft. in diameter, at a hangar at the edge of the city of Pasadena. Trial flights, made at midnight, have proved most successful. The craft conforms to the requirements and limitations stipulated by the Government, and it is predicted by those who have witnessed the flights that it may be taken over by the United States Aerial Corps.

The dirigible bag will hold 80,000 cubic feet of hydrogen gas when tested in cross-country flights. It is fitted with a 60 h.p. Hall-Scott motor, which is suspended on a frame sixty feet long. Universal joints are used in a shafting which leads to the forward end, where a large single propeller is fitted. The entire bag is netted and is without inner trusses or partitions.

The controlling device, designed by the Waterman brothers, has in five trial flights worked excellently. It is smaller, and responds quicker than any similar device as yet used. Forward control is used entirely.

Five trial flights were made during the early morning hours, before the public was aware that a dirigible was in its midst. A speed of thirty miles per hour was attained. Powerful searchlights were used in the tests. Jack M. O'Connell, well-known balloon and dirigible pilot, and owner of the largest collection of balloons in the west, piloted the craft. Three midnight balloon flights were made by O'Connell and Russell Waterman from the cities of Monrovia to Pasadena, in order secretly to transfer gas to the dirigible from a gas works. In each instance the balloons covered the intervening eleven miles and landed within a few blocks of the hangar. Waterman brothers have declined to make known the actual motive behind the construction of the dirigible. It has been broadly rumoured in Los Angeles, however, that the craft, after additional tests, may be sent to the border.

Shortly before the discovery of the construction of the dirigible, O'Connell and a fellow pilot, Hubert Kittle, together with Frank Edmundson, a cinema photographer, left the Monrovia Gas Works in a 47,500 cubic feet balloon

the foregoing explanation is somewhat vague, and sounds very complicated indeed; but really this phenomenon (one might almost call it that) of the working of a piston and its connecting-rod is quite simple to follow. I would advise anybody sufficiently interested to construct a cardboard model of a piston, cylinder, connecting-rod, and crank, in order to examine the workings more thoroughly, several connecting-rods of various lengths being used. The reader will then realise how essential it is to employ in an engine connecting-rods as long as possible, consistent with light weight; while even now the reader should be convinced of the absolute necessity of light reciprocating parts in a high-speed motor. The shorter the connecting-rods and the heavier the pistons of an engine, the more imperfect is the balance. In a vertical engine perfect balance could only be obtained by connecting-rods of infinite length, or pistons of zero weight, both being, unhappily, impossible of realisation. However, there is one type of engine, containing connecting-rods and pistons of normal design, which is perfectly balanced—the horizontally-opposed type. I now propose to deal with this type, though later I intend to return to the workings of a piston and connecting-rod of an engine whose cylinders are "Desaxé."

and ascended 19,000 feet, thus breaking the Pacific Coast altitude record. The balloon was in the air 11 hours 18 minutes, and most of the trip was above the clouds. Difficulty was experienced in ascertaining the whereabouts of the balloon. At one time, three hours after the ascension, the men were several miles out at sea. A lower air-current was reached and the craft was carried sixty miles inland before descent was made on the top of Telegraph Mountain.

Because the clouds shut them off from the earth, and unable to get their bearings for hours, the men, after reaching the highest altitude, dropped to 15,000 feet. An especially designed parachute had been taken along for the purpose of attempting to break the world's record for parachute drops. Kittle abandoned the drop, not knowing if the balloon was over the Pacific. It later proved that the men were far out to sea.

THE SOCIETY OF BRITISH AIRCRAFT CONSTRUCTORS, LTD.

THE following is a list of the companies and firms who have recently been elected to the membership of the above Society:—

Ordinary Members.—W. H. Allen, Son and Co., Ltd., Sir W. G. Armstrong, Whitworth and Co., Ltd., Arrol-Johnston, Ltd., Brazil, Straker and Co., Ltd., Gwynnes, Ltd., Portholme Aerodrome, Ltd.

Associate Members.—Aceles and Pollock, Ltd., the Allied Aircraft Varnish Co., Ltd., W. N. Brunton and Son, Cellon, Ltd., Saml. Cutler and Sons, Ltd., the Integral Propeller Co., Ltd., Lang Propeller, Ltd., Arthur Lee and Sons, Ltd., Rubery Owen and Co., C. C. Wakefield and Co., Waring and Gillow, Ltd.

SOME NOTES ON THE DESIGN OF AERO ENGINES

A MISTAKE crept into the second part of the article by Mr. John Wallace, published under the above title in our issue of May 24, 1916 (p. 335). The firing diagram for a six-cylinder motor therein reproduced should have been numbered as follows:

1	2	3	4	5	6
12	11	10	9	8	7

And the order of numbers in order of firing reads: 1, 8, 3, 7, 2, 9, 6, 11, 4, 12, 5, 10.

PROGRESS OF AMERICAN AVIATION

By ERNEST L. JONES, American Editor

NAVAL APPROPRIATION BILL

ON June 2nd the House passed the Naval Appropriation Bill, which includes \$3,500,000 for aeronautics, instead of \$2,000,000 as reported by the House Committee on Naval Affairs.

ARMY AERONAUTICS

June 3.

THE House Military Committee has completed its draft of the Army Appropriation Bill necessary to carry into effect the new provisions of the Army Reorganisation Act, signed by the President to-day.

Below is a list of the amounts set apart for aeronautics:—

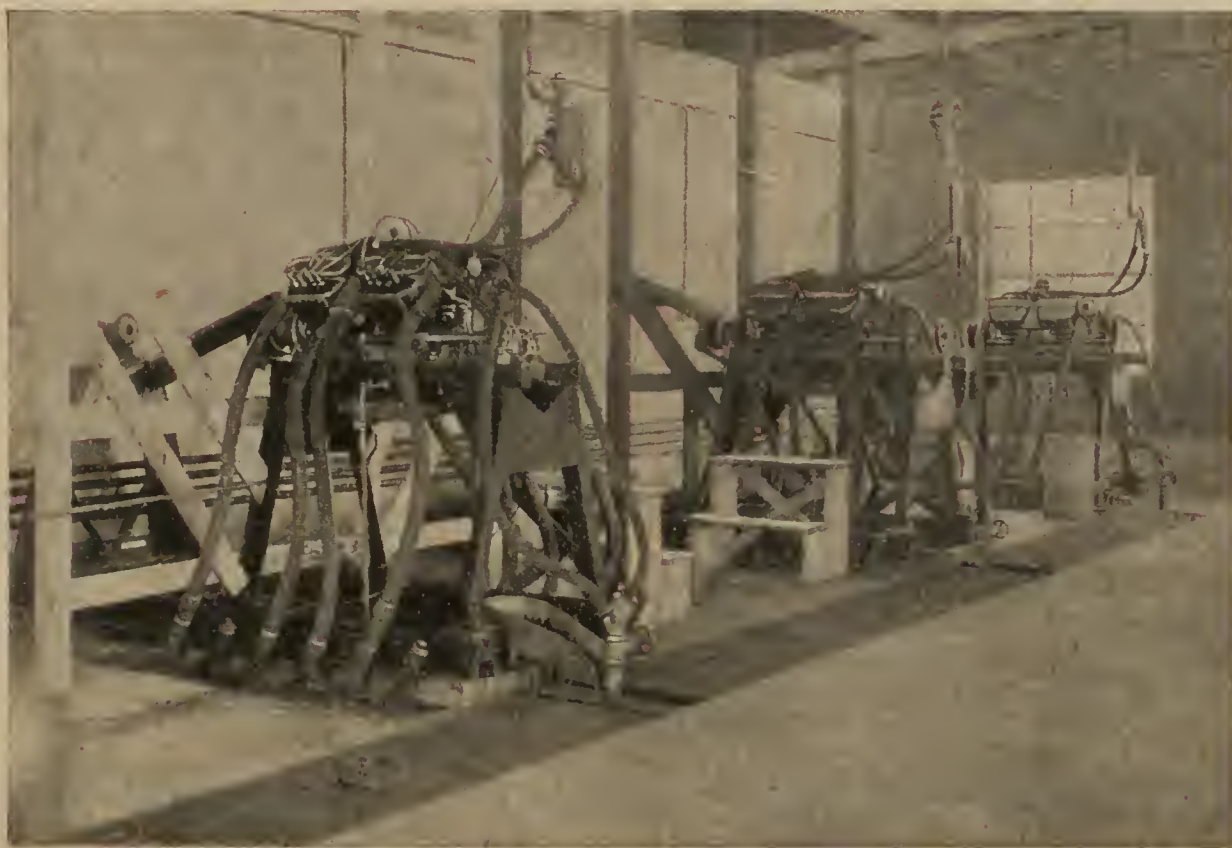
Purchase of land in California for aviation ...	\$300,000
Pay as result of aviation accidents	10,000
Purchase, operation, and repair of aircraft and accessories, and motor-driven passenger-carrying vehicles under the Signal Corps ...	1,222,100
Development of aviation motor	50,000
Special technical instruction of officers of Aviation Section	500
	<hr/>
	\$1,582,600

Engineering Co., Long Island City, N.Y.; Gallaudet Co., Norwich, Conn.; Eastern Aeroplane Co., Brooklyn, N.Y.; the Curtiss Aeroplane Co., Buffalo, N.Y.; Thomas Bros. Co., Ithaca, N.Y.; Sturtevant Co., Boston, Mass.; Burgess Aeroplane Co., Marblehead, Mass.; Sperry Gyroscope Co., Brooklyn, N.Y.; Aeromarine Plane and Motor Co., Avondale, N.J.; General Aeronautic Co., New York, N.Y.; Simplex Automobile Co., New Brunswick, N.J.; and the Motor-Compressor Co., Newark, N.J.

This trip proved of great interest, and was very instructive in showing the progress that is being made in the continued improvement of the manufacture of aeroplanes and motors.

In order to provide the First Aero Squadron, S.C., with new material, on March 30, 1916, an order was placed for four Curtiss aeroplanes of 90 h.p. Acceptance tests were carried out at Newport News, Va., during the first part of April. With sufficient fuel for a flight of four hours, pilot and passenger weighing 330 lb., this aeroplane showed a climb of 4,000 ft. in ten minutes, a slow speed of 40 m.p.h., and a high speed of 76 m.p.h.

On April 18 four additional Curtiss machines of the R-2 type, 160 h.p. Curtiss motors, were ordered. These were also tested at Newport News, and with a load consisting of four hours' fuel, pilot and passenger weighing 330 lb., and



A CORNER OF THE B. F. STURTEVANT CO.'S NEW FIREPROOF AEROPLANE MOTOR TEST HOUSE, SHOWING THREE OF THE 140 H.P. EIGHT CYLINDERS ON THE TEST STANDS

SIGNAL CORPS ACTIVITY FOR 1916

WE have received the following official information from the Signal Corps:—

For the purposes of inspecting, testing, and accepting aeroplanes, motors, and other aeronautical accessories, a board of officers, consisting of Capt. V. E. Clark, S.C., First Lieut. T. De W. Milling, S.C., and First Lieut. B. Q. Jones, S.C., was convened in Washington, D.C., on April 5. With the object in view of obtaining the most expert civilian advice, Mr. Henry Souther, one of the most eminent engineers in the country, has been secured as consulting engineer.

This board, in May, accompanied by Mr. Souther, made an inspection trip to the following aeroplane and motor factories: Sloane Aeroplane Co., Plainfield, N.J.; L-W-F

150 lb. of dead weight, showed a climb of 5,000 ft. in ten minutes, a slow speed of 46 m.p.h., and a high speed of 92 m.p.h. On April 28 eight more of this same type were ordered. The delivery of all of these machines was completed during May.

After receipt of the 160 h.p. type, the four 90 h.p. Curtiss were sent to the Signal Corps Aviation School, San Diego, Calif., to be used in the instruction of students.

Specifications were sent out in April to the various aeroplane manufacturers, requesting that bids be submitted for the purchase of twelve reconnaissance aeroplanes, to be equipped with the six-cylinder Hall-Scott 125 h.p. motor. The contract has not yet been awarded. These aeroplanes will be used in forming the Third Aero Squadron.

Col. George O. Squier, S.C., assumed command of the Aviation Section on May 20, 1916. He has just returned from London, where he was on duty as Military Attaché.

WRIGHT-CURTISS CONSOLIDATION

THE carefully preserved mystery which has been talked of by the aeronautical world in America for the past month or more has now become a matter of speculation. That negotiations are in progress, looking to some sort of combination or affiliation, are not now denied at the Wright offices, but the story that the stock of the Curtiss and Wright companies has been and is held by the same group is vehemently put down as untrue.

Readers are familiar with the purchase of the Wright company from Orville Wright and subsequent changes, and with the formation of the new Curtiss company and the acquisition of the Burgess company. Will we next see a consolidation of these two biggest interests and the end of the patent litigation?

The original 1903 Wright machine, the first to fly, with the engine on its side, has been assembled and put in repair, and shipped to Massachusetts Institute of Technology, where Orville Wright will be among the guests at a celebration which gathers together the first-born—the first aeroplane, first Edison lamp, first Bell telephone, etc. Later, it is expected, this machine will be presented to Smithsonian Institution.

* * *

NAVAL AVIATOR ROCKWELL KILLED

Lieutenant James V. Rockwell, civil engineer, U.S.N., attached to the aviation branch of the service, was killed at Pensacola on May 24, when a navy aeroplane fell about 150 feet into the water. The accident occurred in front of the aviation station near the conclusion of a flight by Lieutenant Rockwell, who was just finishing his course and soon would have become a licensed pilot.

BURGESS ACTIVITY

One of the notable features of the Boston preparedness demonstration on May 27 was a flight over the heart of the city by a Burgess seaplane. The machine was driven by Aviator Clifford L. Webster, with Geoffrey L. Cabot as the passenger. The craft used was the "Lark," the machine built by the Burgess Co. at Marblehead, Mass., for Mr. Cabot. The two were in the air for a period of nearly one hour.

They left Marblehead at 3.17 in the afternoon and flew across the bay and over Boston Harbour to the mouth of the Charles River, the course of which was followed up to a point beyond the city. Circling there, the seaplane was driven back along nearly the same course and was seen by hundreds of thousands of spectators who were watching the big parade.

Mr. Cabot, who is very greatly interested in stimulating interest for an aerial defence, planned the flight with this point in mind, and during the course of the flight dropped over the city thousands of cards calling attention to America's lack of preparedness in this respect. It is safe to say that no event in Massachusetts has ever had such a notable effect in awakening the general public to an active interest in military aviation.

The return trip to Marblehead was made safely and the aeroplane landed shortly after 4 o'clock, having covered about 50 miles.

Two Burgess machines of the Dunne type are now in active service in the 2nd Battalion New York Naval Militia, having been shipped from Marblehead on May 27, and set up for training purposes off Vincent Astor's estate at Rhinebeck, on the Hudson. Aviator Webster was sent down by the Burgess Co. to superintend the flying, and has been busily engaged during the past two weeks instructing officers of the battalion. A third Burgess machine is soon to be shipped to the same organisation, while a fourth is due to go down some time early in the summer. This will give the 2nd Battalion a total of four machines, far in excess of the aircraft available for any other Militia organisation in the country, and not greatly exceeded, unfortunately, by the strength of the United States Navy during the past few months.

MORE FLYING SCHOOLS AND AERIAL TOURS

Following the arrangement made by George Grundy, of the Grand Central Palace amusement resort, for teaching of flying at reduced rates and the furnishing of aerial tours about Manhattan and to coast or inland cities in Benoist land and water machines, comes the announcement of the American Trans-Oceanic Co., formed by Rodman Wanamaker.

Mr. Grundy some years ago left commonplace business pur-

suits to enter the amusement field, and made a big success of the Grand Central Palace dancing, skating, billiard, pool, bowling, swimming, restaurant combination. Now he has added aviation to his list of amusements, and a full course in flying, land or water, may be had for \$250, or one trial lesson for \$25. A 90-acre field has been leased close to Midland Beach, Staten Island, with 2,000 ft. of water front, with fine beach facing New York Harbour. Two machines, built by the Benoist Aeroplane Co., of St. Louis, have been ordered for immediate delivery, and there will follow in the next instalment a big six-passenger 200 h.p. twin-engine machine for passenger work. Trips around Manhattan Island and to near-by cities or resorts will be made, and for the first time New York will have an aerial taxi service. The Staten Island Aviation School, as the official name runs, has its New York office at 119, Lexington Avenue.

The Wanamaker Company has opened offices at 280, Madison Avenue, and is looking for a hydro-aeroplane site in the vicinity of New York. Two Curtiss model F flying boats will start the equipment, and these and any others added will be for hire for trips to any point. Stuart MacDonald, a Curtiss flyer and late manager of motor sales at the Buffalo plant, will have direct charge.

The Federal Aircraft Co., of 1790, Broadway, has leased a land site at Oakwood Heights, and offers instruction at the lowest price yet—\$50 for 10 lessons and additional ones at \$5 each. The ten lessons are promised to fit a man so he can say he is an actual aviator. A big new Martin tractor starts the equipment.

A private enterprise, organised by Redmond Cross, an early amateur Wright flyer and a New York banker, is in operation at Governor's Island, where flying is seen daily by commuters from Staten Island.

The 1st Battalion, Naval Militia, from the Granite State ship at West 96th Street, New York City, is operating its Curtiss flying boat near Bay Shore, L.I., where a school will also be soon in operation using the "jitney" aeroplanes now being built by Charles L. Lawrence and S. S. Pierce. The school of the L.W.F. Engineering Co. is in operation, and there is great activity all about New York with the older concerns.

AIRSHIP FREIGHT LINE

In the House of Representatives Mr. Emerson has introduced the following joint resolution, which was referred to the Committee on Interstate and Foreign Commerce and ordered to be printed:—

"Resolved by the Senate and House of Representatives of the United States of America in Congress assembled, that the consent of Congress is given to Ralph T. Staniforth, of Cleveland, Ohio, to operate an airship line between Cleveland, Ohio, and Detroit, Michigan, and intermediate points for the purpose of carrying passengers and freight."

NEW MODEL CURTISS

A new model Curtiss, a copy of the machine designed by the Toronto Curtiss plant, is being worked on in Buffalo. It will have two 160 h.p. motors, tractor, land type, to carry pilot, two observers or bomb throwers, and several hundred pounds of ammunition. Expectation is keen on the Model T 1,000 h.p. four-motored machine of 135 ft. spread.

THE THOMAS AEROPLANE CORPORATION

We are now in a position to publish further details relating to the above Corporation:—

Earnings—It is estimated that on the basis of an annual production of 100 aeroplanes and 200 motors there will be a balance (amounting to more than \$12 a share on common stock) applicable to dividends upon common stock with participation as stated for preferred stock.

Management—The new company will obtain the services of Mr. B. D. Thomas, who as chief designer of aeroplanes for Mr. Curtiss designed the America type of machine and the so-called J. N. Military Tractor, many of which have been sold to foreign Governments, and the services of Messrs. G. H. Abel and H. N. Bliss, the designers of the Sturtevant motor and the present Thomas motor.

NEW CORPORATION

FEDERAL AIRCRAFT AND MOTOR CORP., 1790, Broadway, New York.—Capital \$1,000,000, all common stock. The company is organised under the laws of Delaware to manufacture and trade in aeroplanes and motors. Walter E. Kittell, whose machine will be built, has recently obtained a patent on a balancing device which is claimed not to infringe the Wright patent. The shares are being sold by O. E. Chaney and Co., 15, Broad Street, New York, at \$4 per share, par value \$10.

UNITED STATES EXPORTS

March, 1916, 2 aeroplanes (\$8,400), parts (\$694,300), total, \$702,700; same period 1915, 9 aeroplanes (\$89,450), parts (\$77,107), total, \$166,557; nine months ending March, 1916, 266 aeroplanes (\$2,138,395), parts (\$3,726,512), total, \$5,864,907; same period, 1915, 34 aeroplanes (\$272,365), parts (\$244,830), total, \$517,195.

MODEL AEROPLANES—XXXVI

By F. J. CAMM

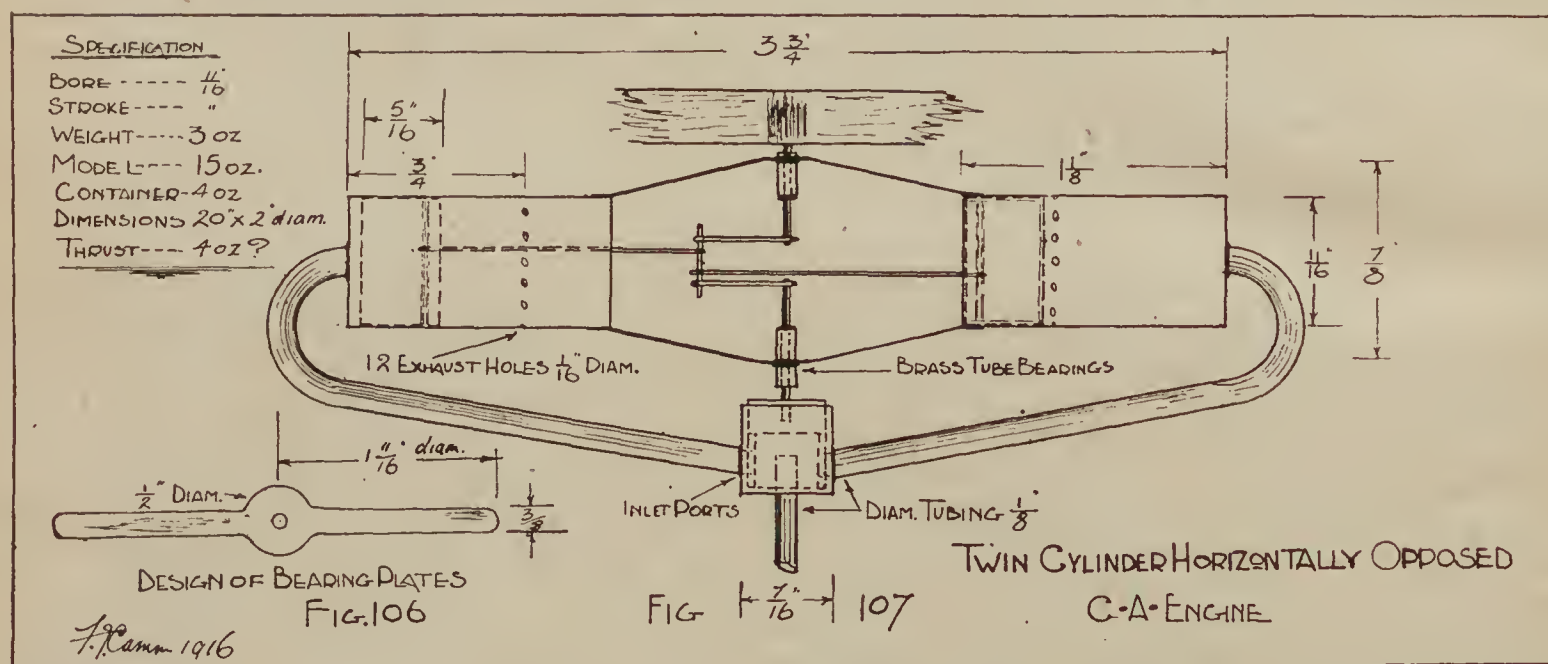
THE subject of this week's illustration—a twin cylinder horizontally opposed c.a. engine—has been designed to fly a machine of simple construction, entailing a knowledge of construction compatible with the beginner. I have submitted the design to several engineers competent to judge, and it has given them the impression of being quite practicable, of extremely simple construction, and not too complicated in principle to be beyond the ken of the beginner. As drawings have now been given of two distinct types of such motors—rotary and stationary—it should be possible for the reader to comprehend their requirements, and would thus be of assistance to him in designing a plant of his own, embodying improvements suggested thereby.

In construction it does not differ in essential details from the rotary engine, so that my remarks can be confined to methods of assembling and the overcoming of some of the difficulties confronting the tyro building such an engine for the first time. But firstly the fundamental principle of it should be clearly outlined. The compressed air, then, enters the rotary valve from which the inlet pipes grow; and which consists of a piece of $\frac{7}{16}$ -in. brass rod bored to receive the rotary valve, which is driven off the crank-shaft. The diameter of the valve is $\frac{3}{8}$ of an in., and should be turned to make a driving fit within the bore, into which it

make a set of assembling jigs and gauges, which much simplify matters; but obviously this is out of the question for one plant. In assembling, then, a sheet of glass or metal with a true surface should be requisitioned, and the cylinders placed upon this while the front bearing plates shown at Fig. 106 are being soldered to them. In order that they may be attached centrally to the cylinders, their diametrical centres should be scribed upon them and the centre of the bearing plates soldered over them. By using a surface plate (the glass or metal sheet above referred to) it is possible to ensure that the true longitudinal axes of the cylinders lie in the same plane—in other words, that the cylinders do not make an angle with one another.

Another point which may puzzle the builder is the locating of the crank-shaft bearing tubes in alignment with one another; but if one is first soldered into place and a piece of wire passed through it the position of the second can easily be determined. It is imperative that the crank-shaft should revolve exactly at right angles to the piston.

In drilling the exhaust ports small burrs are bound to form inside the cylinder. Several ways occur of obviating this. The most orthodox way would be to insert a parallel reamer, which would cut the superfluous metal away. Failing this, they may be scraped off with a small scraper such as would be used to remove the sharp edges of the



must be afterwards ground in with rotten stone. The valve is hollowed out as shown dotted in the drawing, the inlet from the container entering this through a hole drilled in the head of the block forming the valve seating, and into which it is soft-soldered. When soldering the valve to the crank-shaft, the throw of it should be in such a position that the inlet port drilled in the wall of the valve is coincident with one of the inlet pipe apertures. Thus one inlet is open while the other is closed. As soon as pressure passes through the port into the cylinder head and the piston commences to travel the pressure is automatically shut off from that particular cylinder by virtue of the revolution of the crank-shaft, which in turn rotates the valve. As soon as the piston has reached the extent of its travel the compressed air exhausts through ports drilled in the cylinder walls, and synchronous with this exhaustion the valve, which has made exactly half a revolution, opens the inlet to the second cylinder—and so the cycle of operations continues. The exhaust takes place before the piston reaches the bottom of its stroke in order that some of the air compressed by the piston on the up-stroke can be expelled. So much for the principle—now with regard to assembling. Of course, where only one engine is required, the process of assembling is much more laborious than when a quantity is being made, as in the latter case it would be necessary to

entering edge of the cylinder. But the best method, perhaps, would be to insert a piece of tube of the same diameter as the piston (and of such a length to admit of its being pulled out), drill through, and then extricate the tube, which would bring the burrs with it.

A further important matter often overlooked is the careful balancing of the parts. It is conducive to the smooth working of the plant to make both pistons, cylinders, connecting rods, etc., of *exactly* the same weight, so that when the motor is poised by the centre, with the throw of the crank dead central, it balances in a perfectly horizontal plane.

In sweating the inlet pipes into place the solder has an annoying habit of choking the bore of it. The writer has found it good practice to insert a length of oiled string into the tube while soldering; the oil, besides creating a repulsive effect with solder, makes possible the easy release of the string.

The connecting rods must be accurately set out with dividers in order to maintain the same position of travel in both cylinders—they are also slightly off-set to provide clearance on the crank pin. Not, however, sufficiently off-set to occasion lateral "bucketing" of the piston.

Avoid all kinks or sharp bends in the pipes by filling them with powdered resin, heating them, and gradually working

them round to the desired radius by tapping them with a wooden mallet round a wooden circular-section block. The resin can afterwards be melted out.

Careful fitting and assembling are the factors making for success; airtightness, without losing efficiency by undue friction caused by insufficient clearance between piston and cylinder, should be sought for. And in this respect it is

noteworthy that at high pressure a loose piston is more efficient than one which is a good fit.

(To be continued)

NOTE—We are pleased at all times to reply to queries relating to models and kindred matters. Queries must reach this office by first post Monday morning to ensure a reply in the following week's issue.

THE AIR INQUIRY

Mr. Justice Baillache's Committee resumed the inquiry on Wednesday, June 21, at Westminster into the charges against the administration of the Royal Flying Corps.

Mr. William Joseph Kustell, an inventor, of Wolverhampton, gave evidence as to an attempt last year to obtain the assistance of the War Office in the manufacture of a helicopter. It was suggested to him that he should submit specifications. Subsequently he was told that he must get a machine made by private enterprise before it could be considered, and he received an offer for a finished article that would fulfil certain conditions. That seemed to him a very unsatisfactory state of things.

Mr. C. G. Grey, editor of the *Aeroplane*, said that he had made certain criticisms in his paper about the Air Service. His chief criticism was that those in authority in the Royal Flying Corps—he could not say precisely who, or in what department—had not from the beginning handled the supply of materials in the manner which was best calculated to give our flying officers the best machines available at any one period. He included engines. If the machines now in use in France had been in use during the past winter months, there was every reason to believe that our casualties would have been considerably fewer. He believed that it was possible, not merely to have had the aeroplanes now in use, but better aeroplanes, or at any rate aeroplanes more effective as fighting machines and scouts. From the autumn of 1912, when there was a Military Aeroplane Competition on Salisbury Plain, until the outbreak of war, there was practically no incentive to British aeroplane designers to improve designs on their own account. But for the support given to the aircraft industry by the Admiralty, there was no doubt that several firms who had since done good service to the State would have expired just as other firms had. It would be difficult to prove that any real encouragement was given by the War Office.

It was generally understood that the Royal Aircraft Factory was directly or indirectly responsible for the type of machines used by the Royal Flying Corps. The first machine of any note was the original biplane B.E.2, invented by Mr. de Havilland. In 1912 this was by far the best aeroplane in this country. On account of its excellence it was ordered in 1913-14 in considerable quantities, and it certainly did very good work. The chief criticism against it was the lateral control effected by warping the wings; and that this criticism was sound had been proved by the fact that that system had since been abandoned because of the tremendous strain. Yet a large number of these machines were ordered.

The machines which went out with the R.F.C. at the beginning of the war were:

- The old B.E. 2 C's
- Some B.E. 2 B's (70 h.p. Renault)
- Blériot monoplanes (80 h.p. Gnômes)
- Henry Farman (80 h.p. Gnômes)
- Maurice Farman (70 h.p. Renault)
- A few Bristol Scouts (80 h.p. Gnômes)
- Some 80 h.p. Avro biplanes (two-seaters)

At that period the 80 h.p. Gnome engines did not give, on the propeller, more than 65 h.p., as against the full 70 of the Renault. Of all these machines the Avro "stood up to its work" on active service quite well, and, this considered, one would expect that the authorities would have had a number of machines built by the Avro Company.

The B.E. 2 C had been ordered in quite large quantities from firms all over the country. Mr. Grey said he had it on the authority of one of the best and most successful aeroplane constructors that whereas any fairly experienced aeroplane firm could produce a war aeroplane of the ordinary type on conventional lines in six or eight weeks, the B.E. 2 C took nearly twelve weeks to produce.

There had been six months' wasted work over the R.E. 5 and the R.E. 7 machines, fitted with 120 h.p. Beardmore engines. These machines were never liked by the flying officers, mainly for the reason that it was impossible to land them in a small area, and their ultimate fate was the scrap heap. The same thing happened to the S.E. 4 series, the whole lot of which were eventually scrapped.

In his criticism of various machines Mr. Grey mentioned one in which 250 alterations in the drawings had been made since 1914. This had caused a great deal of delay in their production. Many of these alterations were due to sheer bad drawing and office management and errors in the original drawings—errors

which ought not to have been made. Delay was also caused by a good deal of unnecessary complexity in design. There seemed, further, to have been a great deal of material wasted by insistence upon too close limits of variation, especially in woodwork. His criticism was that the machines should not have been made in quantities before the first of the type had actually made good on service. It was a waste of time and of money. In the case of the 100 h.p. engine designed by the Royal Aircraft Factory, between the first batch of drawings sent out and the final settling down with the design something like 600 alterations in the drawings were made. When the engines began to be delivered they by no means distinguished themselves by their reliability, and gave a great deal of trouble. There was constant complaint about the cylinders, which required to be renewed. He had never come across anyone who was really enthusiastic about the engine.

The witness added that the general opinion seemed to be that the German aeroplane engines were astonishingly reliable, and there did not seem to be any sufficient reason why ours should not be equally reliable.

Continuing, he said that last year a Sopwith machine was produced which was considerably faster than the Fokker, and it attained the British height record. This two-seater was found to be able to climb its first 1,000 ft. at over 1,000 ft. per minute, carrying pilot and passenger and a load representing a machine-gun. Its speed was 100 miles an hour. It was only in the last eight weeks that these machines had been ordered, and, in fact, the French Government ordered samples of the machine before the British Government. He also mentioned a machine by Mr. Pemberton Billing of which, he said, advantage was not taken by the War Office.

The Chairman drew Mr. Grey's attention to the *Aeroplane* of March 29, in which the phrase occurred:—"We have lost man after man through engine failure over the German lines and through inability of our engines to lift our machines out of the range of the German guns." Have you any evidence of that? he asked.

Mr. Grey: I have no evidence at all except the casualty lists of that period as compared with the casualty lists to-day. To-day we have more flying men and more hours of daylight in which flying is done, and the casualties are certainly not greater than they were at that time.

The Chairman: Surely that is a *non sequitur*?

Mr. Grey replied that it was common talk among flying officers.

General Henderson, cross-examining the witness, asked whether he might take it that the charges against the Royal Flying Corps, other than those now made by the witness, were dropped.

No answer was given to this question, and the Chairman remarked that the charges did not seem to be persisted in now.

General Henderson: You said that the R.A.F. was directly or indirectly responsible for the choice of aeroplanes used by the Flying Corps. Have you got evidence of that, or were you expressing your own opinion?

Mr. Grey: Indirectly, in the sense that whoever selects the aeroplanes for the R.F.C. has very great faith in the capabilities of the Royal Aircraft Factory.

General Henderson: Have you any evidence of any designs being submitted to the Royal Aircraft Factory?—Personally I have no knowledge, but it is an accepted belief in the trade.

Mr. Grey admitted that he had not mentioned that the defective rudder post of the B.E. 4 had been found to have been filed.

Have you any evidence that the B.E. 8 is a bad machine, and that the pilots hold that opinion?—I adhere to that statement from the fact that they were not sent abroad on active service, which appears to indicate that that was the opinion of the pilots. I have also been told of this by pilots who have flown these machines, but I cannot give the names.

General Henderson: That is the worst of it. Nearly everything that is brought before the Committee is gossip.

Mr. Grey: Shall I be allowed to approach the officers of the R.F.C.?

General Henderson: There are many officers now in this country, and I have no objection to their being called.

General Henderson observed that it would be absolutely denied that the Royal Aircraft Factory engine was unreliable as compared with other engines.

General Henderson: The suggestion all through is that there were machines waiting for us—the best in the world—and that we

preferred wilfully to buy others?—The suggestion is that purchases of these machines had not been sufficiently accelerated. They might just as well have been ordered earlier.

You said that pilots had been lost through the inability of the engines to lift the aeroplanes out of the range of the German guns?—The men went out in a strong wind and were unable to get back.

Was it engine failure that prevented these men from coming back?—I do not know.

What is the ordinary height of observation?—About 10,000 ft. on clear days.

Can you do any gun-spotting at that range?—No.

Then someone has to come within the range of gun fire?—Yes.

The point is this—the statement would lead any ordinary person to believe that we had sent out pilots with bad engines, and in consequence had to fly so low that they were under fire all the time. Do you know the range of an anti-aircraft gun?—I estimate that the bursting height is anything up to 20,000 ft.

You spoke of the inability of engines to lift aeroplanes out of gun-fire range. Do you think that is a fair statement of the case, when you say that they are within range at from 14,000 to 20,000 ft.—how are we going to do any work at the front at that height?—No, you cannot.

The Committee resumed its enquiry on Thursday, June 22.

Captain Bennett-Goldney, M.P., said he had taken a deep interest in aviation in England, France, and Germany since 1912, and was in close touch with military life at Canterbury, Shorncliffe, and Dover.

He proceeded to enumerate the charges he had to make against the Royal Flying Corps. Among these were the following:—Pilots had been sent to France from England without experience of the type of machine they were there ordered to fly. Inexperienced pilots were sent to France with new and valuable machines; in a single squadron of 12 such machines five were broken on arrival. Pilots had been ordered to fly on long reconnaissances in admittedly slower machines than the enemy scouts, to the danger of their lives. Pilots and observers were allowed to fly without compasses and without maps, to the danger of their own lives as well as of their machines. The majority of the altimeters supplied to our pilots at the front were inefficient, bursting at altitudes of over 10,000 ft., notwithstanding the fact that effective altimeters were obtainable.

The Director of Military Aeronautics had turned down the manufacture of airships in 1912. A serious mistake was made in the non-purchase (under proper tests) of more engines in the United States. The Royal Aircraft Factory was no longer a school of research and experiment, but a large manufactory competing unfairly with private enterprise, with which an attempt was made to create a virtual monopoly.

General Henderson said that, though he had given an assurance, he would not be answerable for the views of brother officers. The totally preposterous charge against himself that he was "against the building of airships" was based on a report on the building of airships for the Navy. Did Captain Bennett-Goldney think that, in order to get a monopoly for the Royal Aircraft Factory, he had deliberately avoided giving his officers the best possible machines. None of the machines now being used were offered months ago and were turned down.

Mr. Pemberton Billing, M.P., was called, and said that before he made his charges he would like to inquire whether any member of the Committee wished to examine him as to the qualifications upon which he based his justification for constituting himself a critic of the Air Service.

The Chairman: We will ask you questions when you have given your evidence.

Mr. Billing: There is one other question I should like to ask, and that is whether I may have at this table the assistance of counsel in matters of law and to prepare any questions or answers I have to give or to ask.

The Chairman (after consulting with his colleagues): I do not think there is any objection.

Mr. Billing said that his charges were under the following heads:—Inter-departmental and inter-Service intrigue; promotions unsystematised, unsound, and irregular; wasteful expense in the training of pilots under a system incomplete and unnecessarily dangerous; failure to select the best available machines; employment as fighting machines of aeroplanes dangerous from being faulty in construction, faulty in design, defectively armed, and therefore outclassed by the enemy; employment under active service conditions of incompletely trained men, more particularly on machines of a type of which they are entirely ignorant; orders to fly at night without the provision of properly lighted landing places; orders to fly at night in spite of ground mists or fog; consequent waste of valuable life due to maladministration; cases justifying charges made by him in the House of Commons (March 22 and 28) of criminal negligence tantamount to murder.

The most important allegation he had made was that of criminal negligence tantamount to murder, and he would deal with it first.

Mr. Billing proceeded to read several letters which came to him as the result of the "atmosphere" which he created in the House.

The first of these, relating to the death of Major Penn Gaskell, was dated March 29, 1916, and ran: "Dear Sir,—Two of my

sons are in the Royal Flying Corps, and another is captain in the R.A.M.C., and I do not want their careers blasted as they would be if you divulged my name, but I know you won't do that. Mr. Tennant is reported to have said that no officers were forced to go up against their wishes, and that it was left to their discretion. He is misinformed. Major Penn Gaskell, who was Squadron Commander at Ruislip, received an order from the War Office about six weeks ago to send an airman up, as they expected a Zeppelin. He 'phoned back that it was foggy, and that it would be suicidal for anyone to go up. The War Office 'phoned back and insisted upon someone going up. Major Penn Gaskell said he would go up himself, and that he knew he was going to his death, and, like a true hero, went up. It was so dark that he ran into a tree; his petrol tank burst, and he was burnt to death, but he lived long enough to say he never expected to come down alive. He was a skilled man, lately returned from the front, and was beloved of all."

The Committee resumed its enquiry on Friday, June 23.

Mr. Pemberton Billing, M.P., continued his evidence.

On taking his seat at the witness-table, Mr. Billing suggested that some method should be adopted to secure a declaration from those who attended as to who and what they are. "We are living in the midst of spies," he said, "and it is quite possible that some remark of a witness, or of a member of the Committee, might fall on receptive ears."

The Chairman (Mr. Justice Bailhache) replied that that was one of the difficulties attendant on a public inquiry, and they must run that risk for the present.

The witness began by referring to a case in which a machine with an experimental Royal Aircraft Factory engine caught fire in the air, the bombs exploded, and the pilot (E. T. Busk) was burnt to death in the air. The machine was a B.E. 2 C fitted with an R.A.F. engine. He read a letter from the pilot's father, in which he said that his son was the designer of the R.A.F. aeroplane B.E. 2 C, the first inherently stable machine.

He never ceased to urge the necessity for swift aeroplanes (continued the letter). He designed the B.E. 2 C when he was 26 years of age, and in this machine stability, not swiftness, was the object.

Had he lived he would not have rested until aeroplanes had attained a greater velocity, which he considered was essential in flying. His career was cut short.

Undoubtedly the progress of aviation has suffered in consequence.

General Sir David Henderson said that this was a Naval Air Service case. No R.A.F. machines or pilots were sent to Gallipoli.

"Before you leave your first case," said the Chairman, "what is the negligence you suggest?"

Mr. Billing replied that when an engine caught fire in the air it might be due—provided it had an experienced pilot as was the case here—to many reasons, all of faulty design of the engine. There was a tendency in the R.A.F. engine to unequal expansion and contraction of certain parts owing to faulty design, and that caused the cylinders to crack.

This, in his opinion, was due to the faulty design of the engine. Mr. Billing read a letter from the father of the pilot, in which he said that he had a younger son lost in Gallipoli, but on General Henderson's pointing out that the Royal Flying Corps had no pilots or machines in Gallipoli the case was not further proceeded with. The next case was that of Captain P. Warlow, who was lost in the Channel on December 30, 1914, while flying home on leave. Mr. Billing's information was that the machine was worn out and considered unfit for further active service in France. If so, it was terrible to think that an officer was either ordered, or even allowed, to fly such a machine across the Channel.

General Smith-Dorrien: Might not the machine have been returned home because, owing to improvements, it was obsolete for the front, although good enough for use at home?

Mr. Butcher: Have you any *prima facie* evidence to show that this machine was in fact worn out?

Mr. Billing said that when the Committee got the details officially they would be able to form an opinion on the point. The evidence he offered was the result of conversations among officers and those who knew the details.

Case No. 3 was the death behind the lines in France of Captain W. Lawrence, also flying a Blériot machine, the wings of which "folded up in the air." When Mr. Billing was pressed to say whether he had got his information direct from an eye-witness he seemed to be unable to remember, but fell back on the fact that "of course there will be a report of this case at the War Office."

In regard to Captain Roche, who was killed on January 21, 1915, and whose death was stated to have been caused by defective bombs, which blew up on landing, he said that his information, was also based on discussion by officers.

The death of Lieutenant T. Dalton Downing was due to "the usual B.E. 2 C spiral" and nose dive of 300 feet at the Central Flying School on February 25, 1915. It might have been due to over-confidence on the part of the pilot, caused by his flying this exceptionally stable type, or to his own mismanagement. On August 24, 1915, Captain G. W. Mapplebeck was killed while testing a Morane machine, although this type of machine had six months previously been condemned by the French Government as unsuitable and unsafe.

General Smith-Dorrien observed that a type might pass out of date because it was of no use for fighting, not because it was unsafe.

Mr. Billing added that the safety belt was improperly fastened.

The Chairman pointed out that these were the kind of specific complaints of negligence that the Committee wanted.

A further case was that of Major Unwin. The officer had no experience. The War Office telephoned for two airmen to go up, and a reply was sent that the ground was not suitably lighted, that the men were not experienced, that there was a thick ground fog, and that it was not safe.

"The greatest fear any flying man ever had," said Mr. Billing, "is that he will lose his nerve and get what is colloquially known as 'cold feet.' The result is that if a pilot is ever ordered to do anything, no matter how foolhardy, how ill-advised, how dangerous, or how unnecessary, he will generally prefer to take chances and attempt it than to be known as a man with 'cold feet.'" Continuing, witness said he believed that there was a Zeppelin raid on this particular night. Major Unwin would not disobey orders, and rather than send men up went up himself and was killed by crashing into a tree. He believed he was right in saying that this officer had never been in the air at night before.

The Chairman: Are you suggesting that this officer was ordered to go up despite his remonstrances?

Mr. Billing: That is the suggestion I make, and it would be interesting to ascertain whether a pilot is obliged to go up if he is ordered to. Witness added that the type of machine was quite unsuitable for attacking Zeppelins. He knew of cases where men had been sent up with nothing but a Winchester repeating rifle across their knees. This was done merely to stop popular clamour.

In reply to Mr. Butcher, witness said that an officer was ordered to go up despite atmospheric conditions. He confessed that he himself would be frightened to fly at night without having been trained.

The Fokker machine, the performance of which had been largely exaggerated, was only wonderful in comparison with the machines we put up against it, and not wonderful when compared with a machine we had in this country, but which we did not employ. Of the first three months after the Fokker made its appearance there were 12 deaths in 17 days of the month of March, 1916. In the 29 days of February there were 18 deaths, and to January 29, 26 deaths, to say nothing of about 50 pilots wounded and many missing.

Mr. Butcher: Have you ever flown over the German lines?—If it is relevant I will answer. I flew over the German lines at Verdun the week before last. Of course, I was not doing so officially, but by courtesy of the French Government.

Mr. Billing inquired whether witnesses before the Committee were privileged.

The Chairman: You are all in the same position, whatever that may be. Do you mean whether you will be liable for an action for slander?—That was the reason I was asked to make the enquiry.

The Chairman: You will certainly not be liable.

Mr. Billing read a letter from a squadron commander of the R.F.C. in which he said that the "incapacity and dishonesty with which the Flying Corps is conducted is sufficient to justify drastic charges." The primary complaint contained in the report, which was couched in strong terms, was summed up in the statement that the writer could bring forward "numerous cases of expert pilots being sent to almost certain and altogether profitless death by the lack on the part of their commanding officers of the most rudimentary knowledge of the subject."

"It is a very serious statement," Mr. Justice Bailhache remarked.

Another passage in the report stated that a certain General in the R.F.C. had no knowledge of aviation, and was governed by the principle that men should spend as many hours in the air as possible.

"There is no possible military reason why we should not have the officer's name," said General Henderson, the Director of Military Aeronautics, speaking almost for the first time.

"This particular officer is General Trenchard," the Chairman stated, after consulting Mr. Billing's manuscript.

Another letter from a captain in the Flying Corps contained the sentence "Stick to the point about the murder and Fokker fodder and you will earn all our gratitude. You were perfectly right, and we all know that every time we see a friend has been killed we know there is a murder if he was on a B.E. 2 C." Mr. Billing added that if he were dealing with the R.N.A.S. he could give evidence that would be acceptable to the legal mind. He had not been connected with the Flying Corps, however, and he had to rely on evidence that was given him by friends and officers.

Turning to his allegations of technical ignorance and administrative inefficiency on the part of senior officers of the Royal Flying Corps, he referred to a detrimental undercurrent of intrigues existing in the corps. The trouble was caused by the existence of four contending groups. The first group was primarily responsible. It consisted of those who had carried on a long and persistent intrigue to get control of both the Air Services and to perpetuate the principles of the Royal Aircraft Factory. The second, while also friendly to the Royal Aircraft Factory, had no ambition, but the existence of the military branch. The third recognised the defects of the factory and wanted to take construction away from it. The fourth went in for intrigues of an entirely different kind—namely, between the naval and military wings. The latter tried to keep the Royal Naval Air Service ignorant of its developments in order that the Royal Naval Air Service should compare unfavourably with and be transferred to it.

In order to show inter-Service relations, Mr. Billing mentioned the case of a Royal Naval Air Service man who went to the help of a Royal Flying Corps officer who had fallen into the sea through engine trouble. The commanding officer reprimanded him, on the ground that Royal Flying Corps men had no right to fly over the sea. "If they fall in, let them drown." In Paris the administrative officers of the Royal Flying Corps and Royal Naval Air Service were not even on speaking terms.

Promotion was one of the fundamental causes of intrigue. Neither seniority nor air experience was taken into consideration. Mr. Billing promised to pick out two of the worst examples of improper promotion. There was, further, an excess of Generals and other senior officers as compared with the Royal Naval Air Service and the French service. There were Canadian pilots in the Royal Flying Corps who could not get British flying pay.

There was waste of expense in training. The system of teaching pilots to land before they could fly was quite wrong, as was also the employment of a stable machine like the B.E. 2 C at an early stage of training. There should be far more encouragement of civilian schools. The cost of training a pupil at a civilian school was about £75, while the cost at a Royal Flying Corps school was nearer £500. The administration of the Royal Flying Corps was trying to get hold of everything, ultimately even of the Royal Naval Air Service itself.

The Committee adjourned.

AIRCRAFT IN ACTION

OFFICIAL INFORMATION

ENGLAND

June 19—Six Enemy Machines Brought Down—The chief point of interest to record is the aerial report of yesterday (June 18), when there was a marked increase in the work undertaken by hostile aircraft. In all, there were 27 combats in which the enemy suffered the following losses: One hostile machine was brought down in our lines near Doullens, and the occupants were made prisoners. Two of our fighting aeroplanes encountered two Fokkers in the vicinity of Lens. One of the hostile machines was driven down damaged. The other was shot down and crashed to earth from 4,000 feet. In other fighting in the air two other German machines were driven down in a damaged condition, and one was brought down near Wingles. Hostile reconnaissances which crossed the lines in force were attacked and dispersed by our aeroplanes. One of our pilots reports seeing two hostile machines hit by anti-aircraft fire. As the results of combats in the air two of our machines were brought down in the enemy's lines.

June 22—Successful Co-operation with Artillery—Yesterday (June 21) in the air there was marked decrease in the activity of the enemy, while our machines carried out a good deal of successful work in co-operation with the artillery.

(Sec German official)

June 23—Two Machines Brought Down—Yesterday (June 22), in fine weather, there was considerable activity in the air along the front. There were 22 combats in the air, mostly indecisive, but two of our machines were brought down.

June 24—Bombs on Enemy Horsed Transport—Yesterday (June 23) hostile aircraft were again active. A reconnaissance of six machines which attempted to cross our lines was attacked by our scouts and driven back. One of our aeroplanes, descending to a height of 900 ft. attacked with machine-gun fire some horsed transport and caused it to stampede.

June 25—Kite Balloons Destroyed—We destroyed three hostile kite balloons this afternoon (June 25).

FRANCE

June 19—Raid on Village South of Verdun—An enemy air squadron dropped numerous projectiles on a village to the south of Verdun where there was a camp of German prisoners. Several of the latter were killed or wounded.

June 22—Raids on Karlsruhe and Mulheim—As a reprisal for the successive bombardments carried out by the Germans during the last few days on the open towns of Bar-le-Duc and Lunéville, our air squadrons have effected several operations in enemy territory. During the night of June 21–22 18 bombs were dropped on the town of Treves, where a great fire was observed. To-day (June 22) a group of nine aeroplanes dropped 40 bombs on Karlsruhe—110 miles from Nancy. Another group of ten aeroplanes bombarded Mulheim, on the right bank of the Rhine. Fifty shells were dropped on the military establishments of the town. The effectiveness of these two bombardments was clearly observed. Pursued by a squadron of Fokkers on returning from Mulheim, our machines engaged them, and in the ensuing fight a Fokker was brought down. One of our machines was compelled to land in consequence of engine trouble. In the course of the day our chasing aeroplanes were also actively employed. Sub-Lieutenant Nungesser brought down his eighth aeroplane, which fell at La Morville, in our wire entanglements. To the south of Lihons a German machine brought under machine-gun fire simultaneously by Sergeant Chainat and Sub-Lieutenant Guynemer crashed to the earth. Sergeant Chainat up to the present has brought down four machines, and Sub-Lieutenant Guynemer nine. Finally, in the region of Einville, north of Lunéville, an enemy aeroplane was brought down by the fire of our artillery. The two German machines which fell yesterday

morning (June 21) to the north-east of St. Mihiel and near the Génicourt Fort were brought down by Sub-Lieutenant Chaput, who has up to the present felled six enemy aeroplanes.

(See German Official)

June 22—Two Enemy Machines Brought Down—One of our squadrons chased a group of enemy aeroplanes that had approached with the intention of bombarding villages in the Meuse Valley. In the course of the pursuit one of our pilots brought down two German machines. One fell in flames to the north-east of St. Mihiel, the other crashed to earth near the Fort of Génicourt. During Wednesday night (June 21) our bombarding aviators dropped a number of projectiles on the stations and railways at Apremont, Grandpré, Septsarges, Romagne, and Briulles, and on bivouacs in the Consenvoye Wood and on military establishments north of Thionville.

June 25—Reprisals for Raid on St. Die—In the night of the 24th-25th German aviators dropped bombs on Lunéville, Baecarat, and St. Dié. The material damage done was slight. Some children were injured at St. Dié. Note has been taken of this action with a view to reprisals.

RUSSIA

June 20—German Aeroplane Captured—In the region of the station of Okhotnikov to the east of Sarny we captured a German aeroplane with the pilot and observer.

June 21—Bombs on Vileika Station—Enemy aeroplanes dropped about 40 bombs on the station of Vileika (east of the Russian lines opposite Smorgon).

June 22—Two German Aeroplanes Brought Down—During the day (June 21) our artillery brought down two German aeroplanes, which fell in our lines, one $1\frac{1}{2}$ miles south of the station of Listopady on the Bologoye-Siedletz railway (behind the front near Krevo) and the other near the Juk farm, seven miles south-east of the mouth of the Oginski Canal. The pilots and observers were killed and the machines were smashed to pieces.

June 23—Bombs on Railway Station—Enemy aeroplanes yesterday (June 22) dropped about 40 bombs on the railway station of Molodetchno (south-east of Vilna).

June 24—Bombs on Mamakhatun—One of our aeroplanes dropped bombs with success on Mamakhatun.

An enemy air squadron dropped some bombs on Rioudnia-Potchaievskia (in the Lutzk sector).

June 25—Enemy Raid on Railway Station—Enemy aeroplanes dropped 20 bombs on the railway station of Polotchany, south-west of Molodetchno. One of our aeroplanes, in a daring flight over the enemy lines, was brought down by his artillery. Our aviators, Captain Bankeiff and Lieutenant Pavloff, although wounded by the continued fire of the enemy, succeeded in landing near our advanced lines.

ITALY

June 21—Bombs on Austrian Air Station—Squadrons of our Caproni and Savoia Farman aeroplanes, amounting in all to 34 machines, bombarded the Pergine aviation station at the head of the Val Sugana (15 miles by railway east of Trent). They were fired on by numerous anti-aircraft batteries and engaged by the enemy defence squadrons, but returned safely, after bringing down three hostile machines. Hostile aircraft dropped bombs on our lines of communication, wounding a few persons and causing some slight damage.

June 24—Enemy Machine Hit by Artillery—Enemy aeroplanes dropped bombs at various points on the Lower Isonzo without any damage. One machine was hit by our artillery and fell in flames near Merna, south of Gorizia.

June 25—Enemy Encampments Bombarded—Hostile aircraft dropped bombs on Tolmezzo-Portogruaro-Ponte Piave, and the Grado Lagoon (west of mouth of Isonzo), causing no casualties and only slight damage. Our Caproni aeroplanes bombarded enemy encampments on the Asiago Plateau and returned safely.

EGYPT

June 20—Raid on Turkish Aerodrome—From the General Officer Commanding-in-Chief in Egypt: A most successful raid was carried out on June 19 by the Royal Flying Corps against a large enemy aerodrome about five miles south of El Arish and 100 miles from our nearest aerodrome. This aerodrome, which consisted of 10 large hangars, was located on June 13 and a strong raid was immediately planned in which 11 machines took part. The first machine to arrive discovered an enemy plane on the ground, apparently about to fly, as the pilot and observer were in their places, with several mechanics at hand. Our pilot descended at once to a height of 100ft. and destroyed the plane, killing the hostile pilot, observer, and mechanics. Another enemy plane found on the ground was also destroyed. Of the 10 hangars two were set on fire and completely destroyed, while four were hit many times with bombs. It is presumed that these hangars contained aeroplanes, and in all probability at least five, and possibly more, were put out of action. Our machines delivered their attack from a height of 600ft., but in spite of being under very heavy rifle, machine-gun, and anti-aircraft gun fire, they continued the attack until all their bombs, 76 in number, were expended. In addition to the aerodrome, enemy camps and troops were assailed both with bombs and machine-gun fire. We lost three machines in the course of the operations. Of these, one was forced to descend about two miles north of the aerodrome; the pilot, however, finding that escape was hopeless, set the machine on fire to prevent the enemy from capturing it. The second fell into the sea, the pilot being rescued by a motor-boat. The third was compelled to land

about eight miles west of El Arish; the pilot endeavoured to carry out repairs, and while doing so he was seen by one of our escorting machines, which at once landed at considerable risk, picked him up, and flew back a distance of 90 miles to Kantara, carrying two passengers in addition to the pilot—an extremely gallant feat. I cannot speak too highly of the manner in which this attack was carried out. (El Arish is a small town near the Mediterranean on the northern caravan route from Egypt to Syria, and some 30 miles west of the Turco-Egyptian border. Kantara is on the east side of the Suez Canal, between Port Said and Ismailia.)

(See Turkish Official)

June 21—Aircraft Work in Egypt—The following references to the work of aircraft occur in General Sir John Maxwell's despatches covering the operations in Egypt from November, 1914, to March, 1916, and also despatches from Major-General Sir A. Wilson respecting the operations in the Suez Canal zone.

Despatch No. 1 from Maj.-Gen. A. Wilson, C.B., dated Feb. 11, 1915.

Referring to the preparations for the defence of the Suez Canal he states: The detachment of the Royal Flying Corps was organised, staffed with observers, and equipped with accommodation for its planes.

On Feb. 3 during the attack on the outposts of Kantara: Very efficient service was rendered by the detachment Royal Flying Corps, several reconnaissances over the enemy's lines being undertaken during the day.

On Feb. 5: On the 5th instant our aeroplanes reported that the enemy were retiring towards Katia, while those who had been in front of No. 2 Section appeared to have concentrated about Gebel Habeita. On the 7th, however, our aeroplanes found this camp deserted. Mabeuk was also found to have been vacated, and the nearest enemy on the northern line appeared at Bir-El-Abd.

CO-OPERATION WITH THE FRENCH AIR SERVICE

In conclusion I desire to express my high appreciation of the valuable work done by the pilots and observers of the French hydro-aeroplane squadron and the detachment Royal Flying Corps in the numerous reconnaissances carried out by them previous to and during the advance of the enemy. They were constantly under shrapnel and rifle fire, and carried out their difficult and dangerous duties with courage, resourcefulness, and success.

Despatch No. 2, from Maj.-Gen. A. Wilson, dated Aug. 1, 1915.

AERIAL RECONNAISSANCE

From information received from agents and through aerial reconnaissances, it appeared that during this month (Feb. 13—Mar. 22) the Turks had concentrated mainly at El Arish and Nekhl, while considerable bodies of the beaten troops were withdrawn to Syria, being, it was rumoured, replaced by fresh formations from the north. The enemy withdrew on being engaged by troops from the nearest posts, and a subsequent aerial reconnaissance discovered a force of some 800 infantry and 200 mounted men with guns about ten miles east of the Canal. From the report furnished it appeared that the Turks were entrenching and intended to stay.

AERIAL OBSERVATION

Towards the end of the month (March) reports were received of a considerable concentration of the enemy near Es Sirr, some eighty miles due east of Ballah. These reports were verified later by aeroplane observation, which estimated the hostile force as some 4,000, with guns.

AERIAL RECONNAISSANCE

On the same day (April 7) an aerial reconnaissance reported considerably fewer numbers retiring through Dueidar. Later in the day (April 28) an aerial reconnaissance located a body of the enemy in bivouac near El Hawawish. At daylight on 29th an aeroplane found Hawawish evacuated, but later on located the hostile force moving into Mahadat from the south-west, and the cavalry were directed on that place.

Despatch No. 3, from General Sir John Maxwell, dated Mar. 1, 1916.

AERIAL RECONNAISSANCE

Part of 30th Squadron Royal Flying Corps, under the command of Brevet Major S. D. Massy, I.A., with headquarters at Ismailia, carried out daily reconnaissances without a single important accident. The French Naval Seaplane detachment, with headquarters at Port Said, under the command of Capitaine de Vaisseau de l'Escaille, whose services were placed at my disposal for intelligence purposes, was continually employed in reconnoitring the Syrian and Anatolian coast from the requisitioned vessels Raven and Anco. The results of their work were invaluable. The Anne was torpedoed near Smyrna during an armistice while employed by the Royal Navy, but was fortunately able to reach Mudros, where she was patched up and returned to Port Said. I cannot speak too highly of the work of the seaplane detachment. Lengthy land flights are extremely dangerous, yet nothing ever stopped these gallant French aviators from any enterprise. I regret the loss of two of these planes whilst making dangerous land flights over Southern Syria. Meanwhile air reconnaissance disclosed the presence of the enemy in some force at Ras Manaa, about thirteen miles west of Um Rakhum. (Dec. 12, 1915). On the 1st of the month (Jan. 1916) a collection of eighty tents was reported by aeroplane at Gebel Howimil. On Jan. 19 aerial reconnaissance discovered the presence of a considerable force of the enemy at Hazalin, twenty-five miles south-west of Matruh, the camp comprising at least 100 European and 250 Bedouin tents, including that of the Grand Senussi, which was recognised by Captain Royle, the observer.

This battalion (S. African Infantry Brigade) reached Mersa Matruh on the 20th and 21st, and on Jan. 22, air reports showing that the enemy's position at Hazalin was unchanged, the force shown below set out with General Wallace in command.

VALUABLE WORK OF THE R.F.C.

The Western Frontier Force also owes much to the Royal Flying Corps, whose work was, as always, of a high order. Special mention should be made of a flight by Lieutenant Van Ryneveld to Qara, by Lieutenant Tipton from the Fayum to Moghara, and regular flights to Baharia. The distances covered were very great, and flights of 200 miles have become quite common.

Despatch No. 5, from Gen. Sir John Maxwell, dated April 9, 1916.

AERIAL RECONNAISSANCE

The strength of this force (enemy force at Baharia Oasis), which was discovered by an air reconnaissance on the day of its arrival, was said to be about 500 men; it was increased on the following day to about 1,000.

OBSERVATION BY AEROPLANE

All this time (Feb. 27—Mar. 19) the oases were kept under constant observation by means of aeroplanes. Very long flights were necessary, and to reduce them as much as possible a system of advanced depôts in the desert was started. The credit for originating this system is due to Lieutenant (now Captain) Van Ryneveld, R.F.C., and to Mr. Jennings Bramley, of the Sudan Civil Service, and was first put into practice on the occasion of the flight to Qara mentioned in my previous despatch.

AERIAL RECONNAISSANCE

On the following day (Feb. 21) the hostile forces were located by air reconnaissance at Agagia, some fourteen miles south-east of Barrani. Reports by surrendered Bedouin confirmed the accuracy of this information. A Yeomanry reconnaissance sent out at daylight on the 26th found that the position occupied by the enemy on the previous evening had been vacated during the night, but aerial reconnaissance and officers' patrols discovered him in his old position near Agagia. At 9 a.m. (Mar. 14) aeroplane reconnaissance reported that the enemy was evacuating his camps. The mounted troops under General Peyton then joined General Lukin's column on the high ground, and, as the aeroplane had discovered a hostile force some twenty miles to the west, the armoured cars, under Major the Duke of Westminster, were sent on in pursuit.

EAST AFRICA

June 20—Aircraft in East Africa—The following reference to the work of aircraft in German East Africa occurs in General Smut's despatch on the conquest of the Kilimanjaro region, dated April 30, 1916: The Air Services performed valuable reconnaissance work throughout the operations, and on several occasions considerably demoralised the enemy by the use of bombs.

TURKEY

June 21—Raid on El Arish—At 9 o'clock on Sunday morning (June 18) nine enemy aeroplanes attacked El Arish with bombs and machine-guns. Two aeroplanes were shot down by our fire. One of them was observed to fall down wrapped in flames. This air attack, which lasted two hours, was without result. The enemy was unable to do any damage. (See English official)

[The British official account of this raid gave the date of the raid as June 19, reported the complete destruction of two hangars and the hitting of four other hangars by bombs many times and the destruction of two machines which were outside the hangars. Three British machines were lost, one being set on fire to prevent its capture by the enemy.—Ed.]

June 24—Enemy Aircraft Driven Off—On Thursday morning (June 22) one of our aeroplanes attacked two enemy aeroplanes which were flying over the Gulf of Saros, and pursued them as far as Imbros.

BALKANS

June 17—Enemy Crops Burned—Bulgarian official: Lately the British and French have been destroying our harvest by dropping bombs. On Friday (June 16) four French aeroplanes dropped bombs of special make in the neighbourhood of the villages of Zinelli and Tarashmanli, and the mouth of the Mesta, with the object of setting fire to the fields. They caused several fires, which were immediately extinguished. Yesterday evening (June 16) an enemy aeroplane dropped five bombs on Monastir, wounding two civilians slightly and causing insignificant damage. Other enemy aviators dropped bombs on Valandovo, Dedeli, and Doiran without result. Our aviators dropped bombs on enemy bivouacs at Kara-Sinantzi, Smol, Kalinova, and Mihalova, and the camp and aerodrome at Kukush. All our aviators returned safely.

June 21—Bombs on Enemy Transport—Bulgarian official: Enemy aviators unsuccessfully bombarded Pardeitzi and Doiran and inhabited places in the Rupel sector. One of our aeroplanes dropped several bombs on an enemy transport near Porto Lagos, hitting it and severely damaging the bridge.

AUSTRIA

June 21—Two Hostile Aviators Shot Down—Isolated Italian attacks failed and two hostile aviators were shot down.

June 24—Two Enemy Machines Brought Down—On Friday evening (June 23) Naval Lieut. Bamfeld brought down an enemy aircraft. This morning (June 24) one of our air squadrons bombarded the railway bridge and station at Fonte di Piave and Grado. A French

seaplane was brought down in an air battle in the gulf of Trieste by Lieut. Bamfeld and fell into the sea near Grado.

[Lieut. Bamfeld will be remembered in this country in his capacity as observer to Lieut. Bier during the Circuit of Britain in 1911.—Ed.]

GERMANY

June 19—Two English Machines Brought Down—Two English biplanes were brought down in the course of air flights—one near Lens and the other north of Arras. In each case the enemy aviators were killed. (See English official)

June 19—French Machine Shot Down—A French aeroplane was shot down in the west of the Argonne. A German air squadron attacked the railway station, military works, and factories at Baccarat and Raon l'Étape (south-east of Baccarat, both on the Upper Meurthe).

June 20—Bombs on Military Works near Dunkirk—Our aviators heavily bombed military works at Bergen, near Dunkirk, and Souilly, south-west of Verdun.

June 20—Russian Biplane Forced to Descend—A Russian biplane was forced to descend west of Kolodn, south of Lake Narotch, and was destroyed by our artillery. We dropped bombs on the railway precincts of Vileika (south-east of Vilna). Air attacks on the railway lines between Liakhovitchi and Luninets were repeated.

June 21—British Aeroplane Lost—A British aeroplane was brought down by our anti-aircraft fire near Puisieux, north-west of Bapaume. One of the occupants was killed.

June 21—Bombs on Railway Stations—Our air squadrons attacked the railway stations at Zalyessie (eight miles east of Smorgon) and Molodetchno (further east).

June 21—French Aeroplane Brought Down—A French aeroplane was forced down near Kemnat, north-east of Pont-à-Mousson. The occupants were captured.

June 22—Two French Machines Shot Down—Our anti-aircraft guns shot down two French aeroplanes—one south of Poivre Hill (north of Verdun) and the other near Duss. The occupants of the latter machine were captured. Yesterday morning (June 21) our air squadrons attacked troop concentrations in the Meuse Valley, south of Verdun and this morning they bombarded the railway precincts and troop encampments at Révigny (north-west of Bar-le-Duc).

June 22—Bombs on Russian Railway Bridge—We dropped bombs on a railway bridge over the Pripet south of Luninets (in the Russian centre, east of Pinsk).

June 23—Raid on Karlsruhe—Yesterday (June 22) enemy aviators attacked Karlsruhe, Mulheim (Baden), and Treves. We have to deplore a number of civilian victims. No considerable military damage could be, or was, done at these places. The enemy lost four aeroplanes, two of them being forced to land near Nieder-Lauterbach and Lembach (both west of Karlsruhe) respectively. Of the occupants, who were taken prisoners, two were English. The other two machines were brought down in an air fight. In this fighting Lieutenant Hohen-dorf brought down his sixth enemy machine. Besides these, enemy aeroplanes were brought down, one in the district of Ypres; another east of Hulluch, which was the fifth brought down by Lieutenant Mulzer, and others near Lancon, south of Grandpré; near Merxheim, and east of Gebweiler. So that the enemy lost nine aeroplanes altogether. Our air squadrons attacked the military works at St. Pol and an enemy camp and dug-outs west and south of Verdun. (See French official)

June 24—Two French Machines Brought Down—Near Haumont a French battle-monoplane was brought down in an air fight. Lieut. von Wintgens, near Blamont, shot down his seventh enemy aeroplane, namely, a French biplane.

Russian Railway Station Bombarded—A German air squadron attacked the railway station of Poloczany, south-west of Molodetchno, where movements of troops had been observed. The railway station at Luniviec was also bombarded.

HONOURS FOR THE R.N.A.S.

The *London Gazette* issued on June 22 notified the following decorations:—

DISTINGUISHED SERVICE ORDER

Commander Robert Marsland Groves, R.N. (Wing Commander, R.N.A.S.).

In recognition of his services in command of a Wing of the Royal Naval Air Service at Dunkirk. Commander Groves has by his personal skill as a pilot, and also by his untiring zeal, effected a marked advancement in the general standard of flying on active service. He has on several occasions carried out successful reconnaissances to Ostend under fire, and by his own example has proved the utility and great importance of night flying.

Captain and Brevet Major Eugene Louis Gerrard (temporary Lieutenant-Colonel), R.M. (Wing Commander, R.N.A.S.).

In recognition of his services in command of a Wing of the R.N.A.S. in the Eastern Mediterranean. The present efficiency of this Wing is due very largely to Wing Commander Gerrard, whose personal example and the manner in which he has encouraged the younger officers under his command are all that can be desired.

Lieutenant Douglas Austin Oliver, R.N. (Squadron Commander, R.N.A.S.).

In recognition of his services on the morning of April 25, 1916, when he pursued out to sea the enemy fleet which had bombarded Yarmouth, and flew along the line dropping bombs, being subjected to intense anti-aircraft fire.

Flight Lieutenant Kenneth Stevens Savory, R.N.A.S.
Flight Sub-Lieutenant Richard Sebastian Willoughby Dickinson, R.N.A.S.

In recognition of their services on the night of April 14-15, 1916, when they carried out a flight to Constantinople and dropped bombs upon points of military importance, returning safely to their base after a long flight in rough and stormy weather.

Flight Lieutenant (Acting Flight Commander) Redford Henry Mulock, R.N.A.S.

In recognition of his services as a pilot at Dunkirk. This officer has been constantly employed at Dunkirk since July, 1915, and has displayed indefatigable zeal and energy. He has on several occasions engaged hostile aeroplanes and seaplanes and attacked submarines, and has carried out attacks on enemy air stations and made long-distance reconnaissances.

Lieutenant John Henry Dalbiac, R.M.A.

In recognition of his services as an aeroplane observer at Dunkirk since February, 1915. During the past year Lieutenant Dalbiac has been continually employed in coastal reconnaissances and fighting patrols. The Vice-Admiral Commanding the Dover Patrol, in reporting on the work of the R.N.A.S. at Dunkirk, lays particular emphasis on the good work done by the observers.

DISTINGUISHED SERVICE CROSS

Temporary Lieutenant Gerald Fenwick Haszard, R.M.

In recognition of his services with the Royal Marine Artillery Anti-Aircraft Brigade in France. Lieutenant Haszard has on many occasions shown great coolness and resource under heavy fire, and has for several months controlled his section in an advanced position with marked ability.

Flight Commander (Acting Squadron Commander) Francis Knox Haskins, R.N.

In recognition of his services as a pilot at Dunkirk since February, 1915. He has taken part in air raids on Ostend and Zeebrugge, and has been continually employed in coastal reconnaissances.

Lieutenant Douglas Claude Strathern Evill, R.N., Flight Commander, R.N.A.S.

In recognition of his services as a pilot at Dunkirk since February, 1915. In addition to his work as a pilot, Flight Commander Evill has shown great zeal and ability in carrying out experiments connected with signalling and spotting.

Flight Lieutenant John Joseph Petre, R.N.A.S.

In recognition of his services as a pilot at Dunkirk since February, 1915. He has taken part in air raids on Ostend and Zeebrugge, during one of which he successfully engaged a hostile aeroplane of the Fokker type, and has carried out many coastal reconnaissances under shell fire.

Flight Lieutenant Vincent Nicholl, R.N.A.S.

Flight Lieutenant Frederick George Darby Hards, R.N.A.S.

In recognition of their services on the morning of April 25, 1916, when they pursued a Zeppelin 65 miles out to sea, dived to within a few hundred feet of it, and attacked it with bombs and darts.

Flight Lieutenant Charles Henry Chichester Smith, R.N.A.S.

In recognition of his services on the morning of April 25, 1916, when he pursued a Zeppelin 50 miles out to sea, and on his return journey sighted the enemy fleet accompanied by submarines, which latter he attacked and compelled to submerge.

Flight Lieutenant (Acting Flight Commander) George Henry Beard, R.N.A.S.

In recognition of his services as a pilot at Dunkirk since May, 1915. He has carried out frequent reconnaissances of the coast, and has continually been employed in aircraft and submarine patrols. He has twice attacked German submarines.

Lieutenant Walter Larmond Scott, R.N.R.

Flight Sub-Lieutenant Herbert Glynn Hall, R.N.A.S.

In recognition of his services on the morning of April 25, 1916, when he carried out an air patrol with an observer during the attack by a raiding squadron of enemy ships on Yarmouth. Although severely wounded in the shoulder by shrapnel and weak from loss of blood, Flight Sub-Lieutenant Hall succeeded in piloting the machine back to his station and landed safely.

Lieutenant Charles William Nutting, R.N.V.R.

Lieutenant Edward Raymond Peal, R.N.V.R.

Sub-Lieutenant Horace William Furnival, R.N.R.

In recognition of their services as aeroplane observers and continuous good work whilst attached to a Wing of the Royal Naval Air Service at Dunkirk.

MENTIONED IN DESPATCHES

Flight Commander (Acting Squadron Commander) Joseph Ruscombe Wadham Smyth-Pigott, D.S.O., R.N.

Flight Sub-Lieutenant Isaac Henry Woolf, R.N.A.S.

HONOURS FOR THE R.F.C.

MILITARY CROSS

Temporary Captain William Milne, General List, attached R.F.C.
For conspicuous gallantry and skill. When attacked by two hostile aeroplanes he drove off one, and, though slightly

wounded in the face, drove the other vertically to the ground. He then at once attacked another and drove it down, being this time shot through the hand. In spite of his wounds he landed his machine safely in his own aerodrome.

Lieutenant (Temporary Captain) Archibald William Henry James, 3rd Hussars and R.F.C.

For conspicuous gallantry when making a special reconnaissance. Owing to clouds he crossed the lines at 1,500 ft., and seeing signs of movement in a particular locality, he came down to 800 ft. in order to get a better view. He recrossed the lines at 500 ft. with very valuable information under heavy fire from rifles, machine-guns, anti aircraft guns, and field guns. His engine and machine were badly damaged by the enemy's fire.

Temporary Lieutenant David Wilson, General List, attached R.F.C.

For conspicuous gallantry and skill. After his machine had been damaged in a combat with an enemy machine and was difficult to control, he continued his patrol and assisted another officer to bring down an enemy machine. Later he found another enemy machine, dived at it, and brought it down in flames within our lines.

Second Lieutenant (Temporary Captain) Ellert Webster Forbes, 6th Bn. Royal Warwickshire Regt., T.F., attached R.F.C.

For conspicuous gallantry and skill. He was acting as observer when attacked by two enemy aeroplanes, and was wounded in the chest. On recovering from the shock he saw that his pilot was killed. Climbing into the pilot's seat he succeeded in bringing his machine back from behind the enemy's lines and landing safely.

Second Lieutenant (Temporary Lieutenant) John Anderson Mann, 5th Bn. Scottish Rifles, T.F., attached R.F.C.

For consistent gallantry and skill. In the course of seven days Second Lieutenants Mann, as pilot, and Reid as observer, attacked no less than eight enemy aeroplanes. They drove down four, three of which were seriously damaged. The remainder were driven off, one escaping by getting into a cloud.

Second Lieutenant (Temporary Lieutenant) George Ranald Macfarlane Reid, 4th Bn. Argyll and Sutherland Highlanders and R.F.C.

For consistent gallantry and skill. In the course of seven days Second Lieutenants Mann as pilot, and Reid as observer, attacked no less than eight enemy aeroplanes. They drove down four, three of which were seriously damaged. The remainder were driven off, one escaping by getting into a cloud.

Second Lieutenant Donald Alastair Leslie Davidson, R.F.C., S.R.

Second Lieutenant (Temporary Captain) Hugh Tomlinson, R.F.C., S.R.

MENTIONED IN DESPATCHES

The following officers of the R.F.C. were mentioned in despatches covering the operations in Egypt from November, 1914, to March, 1916:—

MAJOR-GENERAL SIR A. WILSON'S DESPATCH NO. 2

Headquarters Staff

Massy, Brevet Major S. D., 29th Punjabis; Reilly, Capt. and Brevet Major H. L., 82nd Punjabis; Rickards, Capt. G. B., S.R.; Royle, Capt. L., V.A.; Ross, Brevet Major A. J., R.E.; Tweedie, Lieut. D. R.

GENERAL SIR JOHN MAXWELL'S DESPATCH NO. 4

Ross, Brevet Major A. J., R.E.; Moore, Capt. A. G., Manchester Regt., S.R.; Van Ryneveld, Temp. Capt. H. A.; Tipton, Lieut. (Temp. Capt. in Army) R. J., R.F.A., T.F.

GENERAL SIR JOHN MAXWELL'S DESPATCH NO. 5

Jenkins, Capt. F. H., S.R.; Ross, Capt. and Brevet Major A. J., R.E.; Wellesley, Capt. Lord George, Grenadier Guards; Coleman, Second Lieut. E. H., R.F.A., T.F.; Stent, Second Lieut. F. W., S.R.; Girod, Second Lieut. M., Cheshire Regt., S.R. (died of wounds).

CASUALTIES

ROYAL NAVAL AIR SERVICE

INJURED

Probationary Flight Sub-Lieut. Charles Huddy, R.N.

ROYAL FLYING CORPS

KILLED

June 19

Gibson, Second Lieut. J., Devonshire Regt. and R.F.C.
Lieut. John Gibson, Devon Regt., attached Royal Flying Corps, who has been accidentally killed, was the only son of the late George Frederick Gibson, of Newcastle-on-Tyne. He joined the Devon Cyclists, and obtained a commission in the Motor Transport, transferring later to the Royal Flying Corps. Thouless, Second Lieut. A. C., Norfolk Regt. and R.F.C.

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED
Gallie, Second Lieut. C. R., Scots Fusiliers, attached R.F.C.
UNOFFICIALLY REPORTED KILLED

June 21

Aimer, Lieut. G. V., R.F.C.

Lieut. G. Vernon Aimer, New Zealand and Royal Flying

Corps, who was 29 years of age, was killed on June 21 through a fall of some 400 ft. while flying on duty at an aerodrome in an outlying district of London. He came from Auckland, New Zealand, and got a commission in the Royal Flying Corps only lately. Lieut. Aimer was a famous New Zealand oarsman, and some eight years ago won the Challenge Cup for Sculling in Auckland.

PREVIOUSLY REPORTED MISSING, NOW REPORTED WOUNDED AND PRISONER OF WAR

Goodson, Second Lieut. A. R. L., London Regt. and R.F.C.

WOUNDED

Anderson, Second Lieut. G. N., Yeomanry and R.F.C.

Bell-Irving, Capt. M. McB., D.S.O., R.F.C.

Berrington, Capt. J. S. D., Lancashire Fusiliers and R.F.C.

Doune, Second Lieut. F. D. Lord, Yeomanry and R.F.C.

Hellyer, Capt. F. E., Hampshire Regt. and R.F.C.

Shaw, Second Lieut. W. R. D., Essex Regt. and R.F.C.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER

Grinnell-Milne, Capt. D., Royal Fusiliers and R.F.C.

MISSING

Rogers, Second Lieut. C. E., R.F.C.

Savage, Second Lieut. J. R. B., R.F.C.

APPOINTMENTS

ROYAL NAVAL AIR SERVICE

To be Flight Sub-Lieut.:

Acting Sub-Lieut. R. V. Goddard, R.N. : May 15.

Flight Sub-Lieut.:

J. H. D. M. Campbell, granted a temporary commission as Sub-Lieut. (R.N.V.R.), with seniority of June 19, and appointed to *President*, additional, for R.N.A.S.

The following have been entered as Probationary Flight Sub-Lieuts (temp.), with seniority of June 25, and all appointed to "*President*," for R.N.A.S.:

C. R. Vaughan, G. W. Parker, R. B. Morrison, W. Buckley, F. H. McMaster, C. B. Ridley, C. S. Iron, C. R. W. Hodges, N. von L. Tapscott, C. R. Morrish, P. H. Mackworth, R. G. Clarke, H. L. Gaskell, K. B. Preston, D. O. Thomas, and J. de C. Paynter.

Temp. Sub-Lieut. (R.N.V.R.):

E. G. Hopcraft, entered as Probationary Flight Sub-Lieut. (temp.), with seniority of May 22, and appointed to *President*, additional, for R.N.A.S. (commission as Temp. Sub-Lieut., R.N.V.R., terminated).

Temp. commissions as Sub-Lieut. (R.N.V.R.) have been granted to the following Chief Petty Officers, with seniority of June 20:

P. W. Hawkins (appointed to *President*, for R.N.A.S.), and H. I. Eardley.

F. V. Cowell, entered as Sub-Lieut. (temp.) (R.N.V.R.), with seniority of June 17.

G. H. K. Bone (A.B.) and B. Grant, both granted temp. commissions as Sub-Lieut. (R.N.V.R.), with seniority respectively of June 16 and 17.

Midshipman:

R. V. Goddard, promoted to Acting Sub-Lieut., with seniority of May 15, and graded Flight Sub-Lieut.

ROYAL FLYING CORPS

Wing Commander:

Major R. E. T. Hogg, C.I.E., 38th Horse, Indian Army, from a Squadron Commander, and to be Temp. Lieut.-Col. whilst so employed : May 30.

Squadron Commander, from Flight Commander:

Major R. A. Bradley, North Staffordshire Regt. : June 1.

Squadron Commanders, from Flight Commanders, and to be Temp. Majors whilst so employed:

Lieut. (Temp. Capt.) E. L. Gossage, R.A. ; Second Lieut. (Temp. Capt.) P. Babington, Hampshire Regt., T.F. : June 1.

Flight Commanders, from Flying Officers, and to be Temp. Capt. whilst so employed:

Second Lieut. J. R. McCrindle, Gordon Highlanders, T.F. : May 9.

Lieut. G. C. de Dombasle, Royal Canadian Regt. : May 17.

Flying Officers:

Temp. Second Lieut. F. M. Ballard, General List : November 30.

Lieut. A. P. Selwyn, Indian Army Reserve of Officers (since deceased) : May 16.

Second Lieut. N. C. Millman, S.R. : May 27.

Second Lieut. A. L. Clow, Oxfordshire Yeomanry, T.F. ; Second Lieut. R. W. Young, S.R. : May 30.

Lieut. G. M. V. Bidie, Royal Scots, and to be seconded ; Second Lieut. (on probation) A. L. M. Shepherd, King's Royal Rifle Corps, S.R., and to be seconded ; Second Lieut. H. H. Baron, S.R. ; Temp. Second Lieut. G. B. A. Baker, Royal Berkshire Regt., and to be transferred to the General List ; Second Lieut. (Temp. Lieut.) L. W. McArthur, H.A.C., T.F. ; Temp. Second Lieut. R. B. Fricker, Duke of Cornwall's Light Infantry, and to be transferred to the General List : May 31.

Temp. Lieut. A. W. Morey, Royal Scots, and to be transferred to the General List ; Lieut. R. L. Keller, Royal Warwickshire Regt., S.R., and to be seconded ; Second Lieut. M. Allport, S.R. ; Temp. Second Lieut. F. Nuttall, General List ; Second Lieut. D. J. MacDonald, R.G.A., T.F., from an Assistant Equipment Officer ; Second Lieut. A. H. G. Fellowes, S.R. : June 1.

Capt. L. S. Charles, Worcestershire Regt., S.R., and to be seconded ; Lieut. C. G. Burge, York and Lancaster Regt., from a Flying Officer (Observer) ; Second Lieut. (Temp. Lieut.) P. Grosset, Highland Cyclist Bn., T.F. ; Temp. Lieut. J. C. Liddle, Northumberland Fusiliers, and to be transferred to General List ; Temp. Second Lieut. R. F. Sinclair, Manchester Regt., and to be transferred to the General List : June 2.

Lieut. J. A. N. Ormsby, Canadian Motor Machine Gun Service ; Second Lieut. (on probation) V. J. Whitaker, Lincolnshire Regt., and to be seconded ; Temp. Second Lieut. H. B. Hurst, General List ; Second Lieut. J. F. Gordon, Gordon Highlanders, and to be seconded ; June 3.

Equipment Officers:

Temp. Lieut. (Temp. Capt.) M. D. Methven, London Regt., T.F., from a Flight Commander : April 26.

Second Lieut. H. B. T. Childs, S.R., from an Assistant Equipment Officer, and to be Temp. Capt. whilst so employed : June 1.

Assistant Equipment Officers:

Second Lieut. (on probation) R. N. Rowell, S.R. : May 29.

Temp. Second Lieut. (on probation) S. W. Cooper, Machine Gun Corps, and to be transferred to General List : May 30.

Second Lieut. (on probation) H. Rigby, S.R. : June 7.

Temp. Second Lieuts. to be Temp. Lieuts. for duty with the R.F.C.:

D. D. Drury ; C. A. Gladstone ; B. P. Greenwood (now Temp. Capt.) : April 15.

Second Lieut. J. Clark, h.p. List, retires on retired pay : June 20.

Second Class Air Mech. M. L. Horn, from R.F.C., for duty with the Military Wing of that Corps : May 27.

To be Temp. Second Lieuts. for duty with the R.F.C.:

Pte. R. G. Hutchinson, from 1st Glamorgan Yeomanry, T.F. : May 18.

Serg. G. W. Hall, from 17th Reserve Bn., Canadian Expeditionary Force : June 17.

Pte. N. McN. Beaton, from London Regt., T.F., for duty with the R.F.C. : May 13.

Lance-Corp. H. E. Goody, from Royal Fusiliers, for duty with R.F.C. : May 27.

First Class Air Mech. L. S. White, from R.F.C., for duty with Military Wing of that Corps : June 3.

Second Class Air Mech. E. C. Fulton, from R.F.C., for duty with the Military Wing of that Corps : June 9.

Corp. S. H. Gordon, from Edinburgh Academy O.T.C., for duty with the R.F.C. : June 17.

Temp. Qmr. and Hon. Lieut. G. E. Stagg, from R.F.C., to be Temp. Lieut. : May 8.

Second Lieut. (on probation) A. R. Earle, South African Aviation Corps, to be Temp. Second Lieut., from September 18 to October 22, 1915.

Corp. J. L. Trollope, from R.E., to be Temp. Second Lieut. for duty with the R.F.C. : June 17 (substituted for notification in the *Gazette* of June 17).

Hampshire Aircraft Parks

Lieut. W. J. Stutt relinquishes his commission : June 24.

C. A. Hudson to be Second Lieut. : June 24.

SPECIAL RESERVE

Second Lieuts. (on probation) confirmed in rank:

A. M. Thomas, G. Iredell, N. C. Millman, M. Allport, H. H. Baron, R. W. Young, A. H. G. Fellowes.

To be Second Lieuts. (on probation):

W. M. Bevan, H. F. Wright, G. Gilling, J. H. Inskip, G. V. Hirst, F. L. W. Viscount Combermere : May 13.

P. Adams : May 22.

W. V. Bevon : June 7.

J. W. Baillie, F. H. Goodwin, D. S. Kennedy, M. H. Butler, G. S. McGregor, F. O'Keefe, H. J. Every, A. Edwards, C. Elphinstone, G. W. Dampier, T. E. Gorman, W. E. M. Walker, H. J. Butler, C. Kennard, G. R. Kull, A. H. Smith, T. Hayes, F. G. Garratt, E. J. Roberts, P. S. Butterworth, C. C. Morley, H. B. Burrell, G. A. H. Pidcock, E. A. Clark, L. G. Courage, K. J. Box, D. S. Evans, R. G. Fordham, A. T. Croucher, E. D. Clarke, C. J. Kennedy, S. Chappell, E. V. Tinham-Davenport : June 17.

Second Lieut. E. H. McLachlin (previously incorrectly described as G. H. McLachlin) relinquishes his commission : March 28.

Second Lieut. (on probation) E. B. P. Barrow relinquishes his commission : June 8.

Christian names of Second Lieut. (on probation) Herbert Clements Short are as now described, and not as in the *Gazette* of June 10.

AIRCRAFT WORKERS' SPORTS AT HENDON

Miserable in the extreme was the weather which prevailed on Saturday, June 24, at Hendon, when 3,000 spectators saw some very good sport, despite the cold and wet, under the management of the Y.M.C.A.

Welch (of Napier's), who won the mile and half-mile races, showed very good form. He had easy victories, and under better weather conditions, and with stronger opposition, would doubtless accomplish fairly smart times. Stevens (of Napier's) was a rather fortunate winner of the walking race, as had Watts (of Grahame-White's) started on level terms he must have won instead of being beaten, as he was, by 20 yards, after having made up a lot of ground which he had lost through starting when the others were about 150 yards on the way. The championship for most points was gained by Napier's, Darracq's being second and Grahame-White's third. Mrs. Winston Churchill distributed the prizes.

100 Yards—Holden (Grahame-White Co.), 1; Clennell (Napier), 2; Howell (Darracq), 3; nine others ran; won by a yard, foot; time 11 sec.

880 Yards—Welch (Napier), 1; Lewis (Napier), 2; Wilcox (B.T.H.), 3; 5 yards, 8.

220 Yards—Howell (Darracq), 1; Edwards (Grahame-White), 2; Clennell (Napier), 3; 2 yards; 26 4/5 sec.

100 Yards Veterans—Billets (Handley-Page), 1; James (Grahame-White), 2; Duffield, 3; foot; 12 3/5 sec.

Mile—Welch (Napier), 1; Stanton (Napier), 2; Crabtree (Grahame-White), 3; 3 yards, 80; 5 min. 19 1/5 sec.

60 Yards Ladies' Race—Miss White (Darracq), 1.

2 Miles Walk—Stevens (Napier), 1; Watts (Grahame-White), 2; Dover (Darracq), 3; 20 yards, 250; 18 min. 20 1/5 sec.

100 Yards (Directors and Managers): Holden (Grahame-White), 1; Voit (Integral Propeller), 2; Ritchie (Grahame-White), 3.

440 Yards—Babbs (Napier), 1; Edwards (Grahame-White), 2; Luther (Aircraft Manufacturing Co.), 3.

Boys' Race—Williams (British Thomson-Houston Co.), 1; Jennings (B.T.H. Co.), 2; Saddby (Grahame-White), 3; 2 yards, foot.

Cycle Obstacle Race—Woolgar (British Caudron), 1; Bass (Napier), 2; Jenkinson (Wells), 3.

Relay Race—Handley-Page, 1; Napier, 2; Darracq, 3.

Obstacle Race—Crabtree, 1; Bass, 2; Dunkley, 3.

Tug-of-War—Darracq beat Napier by 2 pulls to 1.

Final points for All-round Championship—Napier, 20 1/2 points, 1; Darracq, 10, 2; Grahame-White, 8 1/2, 3.

A MINISTRY OF COMMERCE

The Ministry of Commerce, about which so much is now heard, is set out in full detail in a book which Messrs. Jarrold and Sons announce to appear immediately. The officials of the proposed Ministry, their salaries and their functions are minutely described, and the agitation for this new recognition of commerce is given a more definite shape. The author is Mr. Ernest J. P. Benn, a well-known trade journalist, who should be able to speak with knowledge on these matters, and his scheme for a complete system of trade associations headed by a Minister of Commerce is sure to provoke great interest in trading circles. The title chosen is "Trade as a Science," and the publishers promise that the work will be of intense interest to every trader great or small. A preface is contributed by Lord Burnham.

DAMAGE TO CROPS BY AIRCRAFT

The Board of Agriculture and Fisheries call the attention of farmers to the possibility of loss of, or damage to, growing crops by hostile aircraft. No liability can be accepted by the Government, and no claim can be entertained in respect of damage to property by aircraft or bombardment unless the property has been insured under the Government scheme, particulars of which can be obtained at any Post Office or from any Fire Insurance Company.

NEW CANTEN AT ROTAX WORKS

An interesting function took place at the works of the Rotax Motor Accessories Co. at Willesden Junction on Wednesday, June 14. With the considerable recent additions to the premises and consequent additional staff, the Rotax Co. have found it desirable to erect a large canteen so that their workpeople and staff can be provided with meals and refreshments at a reasonable cost. The canteen is organised and run by the Y.M.C.A., and meals are supplied at cost price.

The canteen, which cost the firm several hundred pounds to erect, will accommodate about 400 people at a time.

The tendency to provide these canteens meets with the hearty approval of the Government officials, and on this occasion the Y.M.C.A. and the Rotax Co. were honoured by the attendance of Major-General Sir Francis Lloyd, K.C.B., D.S.O. (Commandant of the London District), who made a rousing speech to the workpeople, pointing out the vital importance of their work. Incidentally he congratulated the Rotax Co. on the small percentage of eligible men they employed.

Mr. A. Yapp, national secretary of the Y.M.C.A., made an interesting speech and was listened to with deep attention, relating several of his experiences at the front in France, which were greatly appreciated.

Mr. E. Aron made an admirable chairman, and the harmony of the proceedings were added to by a very capable band.

PATENT INFORMATION

This list is specially compiled for AERONAUTICS by Messrs. Rayner and Co., Registered Patent Agents, of 5, Chancery Lane, London, from whom all information relating to Patents, Designs, Trade Marks, etc., can be obtained gratuitously.

LATEST PATENT APPLICATIONS

- 7,950 D. Mackay. Aerostructures. 5/6/16.
8,025 T. G. Mapplebeck. Aeroplanes. 6/6/16.
8,075 J. H. Rose. Flying machines. 7/6/16.
8,167 E. M. T. Boddam. Fuse for shells used against aircraft. 9/6/16.
8,170 T. B. Sharp. Bombs to be dropped or propelled from aircraft. 9/6/16.
8,213 W. C. M. Pettingill. Airships. 10/6/16.

SPECIFICATIONS ACCEPTED THIS WEEK

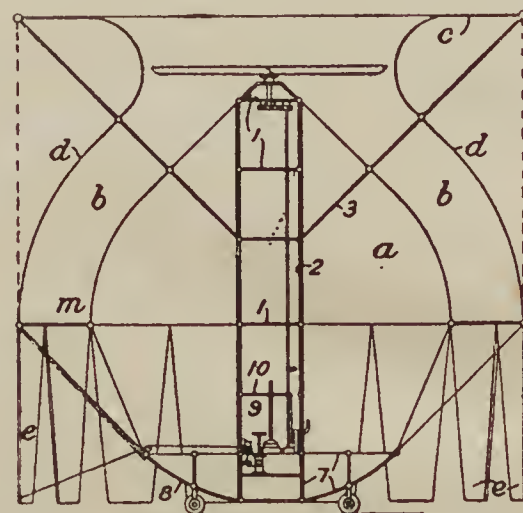
- 14,497 Havens. Aeroplane guy-wire tighteners.
15,558 Steinmetz. Aerial warfare.
16,925 McKinney. Air mines attack from aircraft.

SPECIFICATIONS PUBLISHED THIS WEEK

- 11,279 Wanliss. Guns for use against wire entanglements, submarines, aeroplanes, and the like.

LATEST PUBLISHED ABSTRACT

- 2,943 "Aeronautics." J. R. Porter. Aerial machines of the kind having a hollow pear-shaped body *a* enclosed within an outer surface *d*, whereby an annular air channel *b* is formed through which air is drawn by means of a propeller, are constructed with a vertical framing 2 which supports, through struts 3, the periphery of the horizontal surface *c* and carries at its base an annular hollow float 8. The vertical framework 2 is strengthened by a



series of horizontal rings 1 and covered by cloth or other material. The lower portion forms a cabin 9 having a roof 10. The air channel *b* is provided with a series of vertical baffles *m* to prevent gyratory action of the air. The float 8 comprises a number of radial triangular frames 7 covered with waterproof material. The surface *d* may be provided with flaps *e*, as described in Specification 975/14, which, when closed, fit tightly around the float.

Printed copies of the specification and abstract can be obtained from Messrs. Rayner and Co. at the price of 1s. each.

BOOK RECEIVED

"ALL THE WORLD'S AIRCRAFT WAR FLYING ANNUAL." (Seventh year of issue.) Fred T. Jane. London: Sampson, Low, Marston and Co., Ltd., 1916. 263 pp., illus. Price 21s. net.

NEW COMPANIES REGISTERED

BOURNEMOUTH AVIATION CO., LTD., 10, King Street, St. James's, S.W.—Capital, £6,000, in £1 shares. Acquiring business carried on at Talbot Village, near Bournemouth, as the Bournemouth Aviation Co. First directors, F. E. Etches, H. E. Aldridge, and R. J. Vine.

E. R. CALTHROP'S AERIAL PATENTS, LTD., Eldon Street House, Eldon Street, E.C.—Capital £60,000, in £1 shares. Acquiring from E. R. Calthrop certain inventions relating to aircraft accessories, manufacturers of and dealers in aerial conveyances and aircraft of all kinds, etc. First directors, E. R. Calthrop and Sir John A. Atkinson.

DAVIDSON AVIATION CO., LTD., 231, Hammersmith Road, W.—Capital £10,000, in £1 shares. Builders and makers of aeroplanes, motor boats, and accessories therefor, etc. First directors, W. Stewart-Greene and W. E. Chester.

SPAD AIRCRAFT CO., LTD., 30, Golden Square, W.—Capital £100, in £1 shares.

COMPANY NEWS

BLERIOT MANUFACTURING AIRCRAFT CO., LTD., 49, Old Bond Street, W.—First and final dividend of 20s. in the £, payable to trade and general creditors at 33, Carey Street, W.C., and creditors for application money on deferred shares at same address July 3 and afterwards.





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